

WEEDS OF NATIONAL SIGNIFICANCE

**PARKINSONIA**

*(Parkinsonia aculeata)*

**Strategic Plan**

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This strategy was developed under the leadership of the Dept of Natural Resources, Queensland with full cooperation of all the States, Territories and Commonwealth of Australia.

Comments and constructive criticism are welcomed as an aid to improving the process and future revisions of this strategy.

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## EXECUTIVE SUMMARY

Parkinsonia (*Parkinsonia aculeata*) is one of northern Australia's worst weeds. It is a thorny shrub or small tree that forms thickets primarily along and in water bodies. Current infestations cover over 800,000 hectares. Most of the semi-arid to subhumid tropical areas in Australia are climatically suitable for Parkinsonia. There is an urgency to prevent the weed from spreading further into important areas of conservation value such as the Lake Eyre and Murray-Darling basins, Cape York areas in Queensland and southern regions of Australia, as well as to minimise impacts of existing infestations across northern Australia. The strategy outlines a management system based on a zonal system. Zones will be based on catchments and will be used to prioritise the actions required for this species.

The vision of the strategy is that:

**Parkinsonia is confined and its impact reduced to a minimum.**

The strategy aims to deliver four key outcomes:

**1 Parkinsonia management is coordinated and maintained at a national level.**

- Monitor and evaluate implementation of the strategy
- Increase education and awareness of the Parkinsonia situation in Australia

- Maximise the availability of resources and efficiency of use
- Identify economic impacts and incentives / disincentives
- Use enforcement as a management tool
- Develop a zonal management plan

**2 Zone A infestations (Containment zone) are reduced.**

- Introduce and improve the impact of biological control agents
- Develop integrated weed management techniques

**3 Zone B infestations (Active control zone) are minimised.**

- Promote the integration of Parkinsonia management
- Develop, refine and adopt integrated weed management techniques
- Identify and prioritise areas for different management regimes

**4 Zone C infestations (Eradication zone) are eradicated and new introductions of Parkinsonia are prevented.**

- Eradicate infestations in Zone C
- Develop and maintain early detection and eradication mechanisms
- Prohibit importation, trade and distribution of Parkinsonia

The extent to which these outcomes are met will be evaluated as part of a five-year cycle of review and will determine the success of the strategy.

## THE CHALLENGE

Parkinsonia (*Parkinsonia aculeata*) is a thorny shrub or small tree, native to central America. It was introduced into Australia as an ornamental and shade tree around 1900. It has progressed to be a major weed and infests large areas of Western Australia, Northern Territory and Queensland, amounting to over 800,000 hectares, primarily along waterways. Most of the semi-arid to subhumid tropical areas in Australia are climatically suitable for Parkinsonia, particularly along watercourses and flood plains, and these must be considered as potentially under threat from this weed. There is urgency to prevent the weed from spreading further into the Lake Eyre and Murray-Darling basins, Cape York areas in Queensland, the seasonal blue-bush swamps of the Barkly Tablelands and southern regions of Australia, as well as to minimise impacts of existing infestations across northern Australia.

Prevention of spread is difficult, as water is responsible for the majority of Parkinsonia

seed dispersal events. Any Parkinsonia management strategy must be on a catchment basis, where strategic control is required and where impact or risk of spread is high. It is recommended that management be based on a zonal system, with delegations reflecting level of Parkinsonia management. Control and confinement is possible by integration of a variety of control techniques. Similarly, rainfall events are the key periods initiating major seedling recruitment and new infestations can arise rapidly. Once established the economic costs of control are high, so early detection and control is therefore required to stop new infestations before they establish.

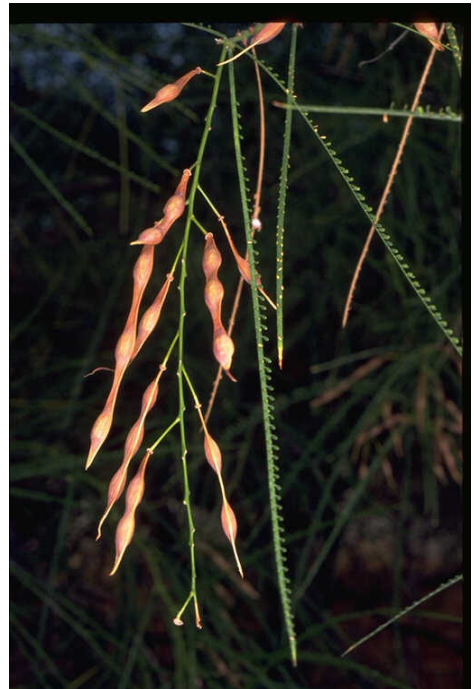
The challenge is to prevent further spread of Parkinsonia within and between catchments and, over time, control manageable infestations. Implementation of the Parkinsonia Strategic Plan will result in containing the spread of Parkinsonia and minimise the impact of established infestations to Australia.



*A dense Parkinsonia infestation.*



*Parkinsonia flower*



*Parkinsonia pods and thorns*  
(Photo supplied by Colin Wilson NT  
NPWS)

## BACKGROUND

Parkinsonia (*Parkinsonia aculeata*) is one of northern Australia's worst weeds. It has received national attention because of its impacts on sensitive riparian ecosystems, forming impenetrable thickets, smothering native vegetation and hindering primary production.

Parkinsonia may be confused with several other weedy trees and some native species. These include the native *Acacia farnesiana* commonly known as mimosa bush or mimosa, prickly acacia and the weeds of national significance *Acacia nilotica* ssp. *indica* and *Prosopis* spp. (mesquites).

### 1.1 The biology of Parkinsonia

Parkinsonia, *Parkinsonia aculeata*, also known as Jerusalem thorn and Mexican palo verde, is a hairless leguminous shrub or small tree, growing from 2-8 metres high. The main distinguishing features of Parkinsonia are the leaves and green stems. Two rows of tiny oval leaflets occur on the edges of a flattened leaf stalk. The branches are armed with sharp spines 7-12mm long. The green bark means the plant is able to photosynthesise even after complete defoliation resulting from drought or grazing.

#### Flowers

Flowers are predominantly yellow, fragrant, with 5 petals, each on a long, slender drooping stalk. Seeds are oval, hard, about 15mm long and borne in straw-coloured pods, 5-10cm long and constricted between the seeds. Seedlings grow slowly during their first year while the root system establishes. In Queensland it is thought that plants live for 10 years and that thickets may die out in drought conditions.

#### Tree

Parkinsonia is a fast growing tree. Flowering in early summer of its second or third year of growth (Figure 1). Pods mature in late summer and can float on water. Approximately 90% of seed dispersed is by water, especially during floods. Seeds can be distributed, though rarely, through mud sticking to animals, footwear and machinery and by animals (goats) and birds eating and passing seeds. Seeds have a thick and extremely hard coat and may remain viable for many years to allow germination under favourable conditions. Seed viability is considered to be 90%. Dormancy has been recorded at 50 years under situations overseas. There have been no studies of the seed bank or seed production in Australia.

#### Growing Conditions

Establishment occurs most successfully in areas where there are distinct wet and dry seasons. Plants grow most readily on flooded clay soils, but they are also commonly observed on lighter soils in low rainfall areas. Dense thickets can be quickly formed along watercourses, around water holes and dams, and where run-off accumulates seeds. Plants can withstand waterlogged conditions and are capable of lowering water tables. Salinity does not affect plant growth and they will grow to the edges of salt-water bodies, but it may affect seedlings. Seeds generally only germinate after significant rainfall events as they require wet soil for several days to induce germination.

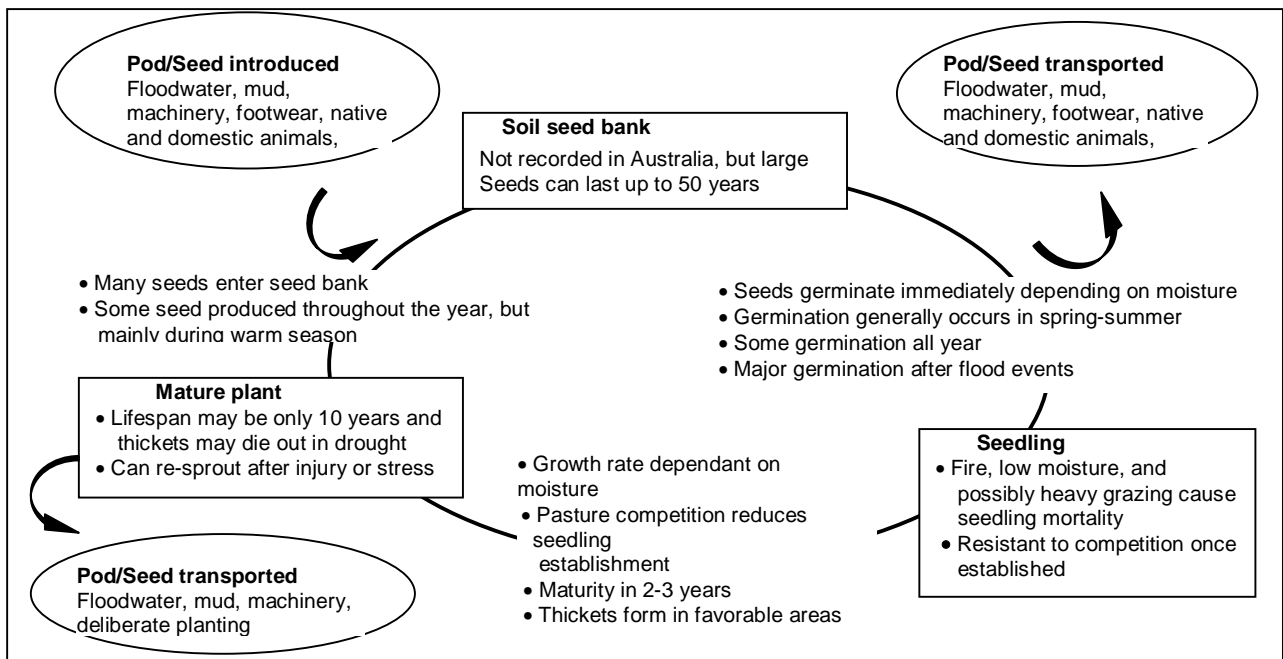


Figure 1. The life cycle of Parkinsonia.

## 1.2 History of spread

Parkinsonia is native to southern United States, Caribbean, Mexico and northern South America. The exact date that Parkinsonia was introduced to Australia is not known, but local knowledge suggests that the plant was established in towns in northern Australia prior to 1900 to provide shade and form hedges. At that time goats were the main stock eating this plant and were probably an agent of its spread. Parkinsonia was subsequently planted around homesteads and watering points from which it gradually spread to water courses, floodplains and beyond.

The total infestation of Parkinsonia in Australia is estimated to exceed 800,000 hectares. Parkinsonia mainly occurs across the north in Western Australia, Northern Territory and Queensland. The exact distribution and location of infestations is largely unknown, due to isolation of areas and difficulties of identification in thickets of mixed woody vegetation. It has not been possible to produce a map for this strategy. In Western Australia it is distributed across more than 500,000 hectares, in all river systems in the Kimberley and Pilbara regions, including large infestations along the Ord, Fitzroy and De Grey Rivers. In the Northern Territory infestations cover 230,000 hectares of various densities, in the Alice Springs, Tennant Creek, Darwin, Katherine and Barkly Tablelands districts. In Queensland, the weed

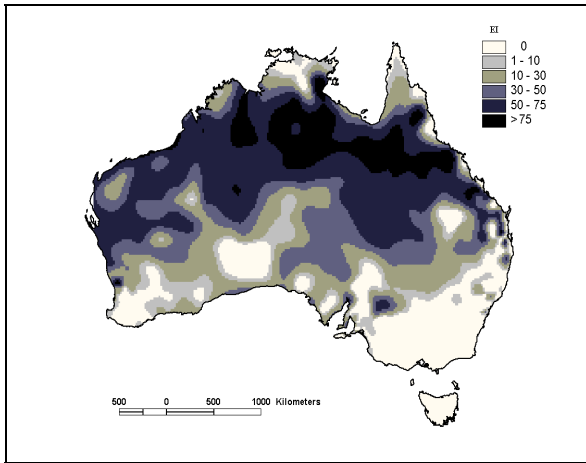
covered 80,000 hectares (1990) over 35 shires. Parkinsonia also occurs in isolated areas of South Australia and far western New South Wales.

The potential distribution of Parkinsonia in Australia has been predicted using CLIMEX (Figure 2). This analysis suggests that Western Australia, South Australia, Northern Territory, Queensland and north western New South Wales have favourable conditions for widespread Parkinsonia infestation, particularly along river systems and adjoining pastoral land. Potential spread is largely limited by cold stress in the south and waterlogging stress in the north.

## 1.3 A weed of national significance

Parkinsonia is generally located in isolated or non-developed regions and so many of its impacts have not been well recorded. Its current impacts, however, can be summarised as:





**Figure 2.** Potential distribution of *Parkinsonia* in Australia. (Data is splined from a CLIMEX climate prediction. EI = Ecoclimatic Index: EI<30 potential for permanent population low, EI>50 potential very high).

#### Environmental:

- Formation of thickets seriously affects ground vegetation through competition for light, water and nutrients. It may in time displace trees such as the coolibah (*Eucalyptus microtheca*) and river red gum (*Eucalyptus camaldulensis*)
- Grasslands and banks are being changed to thorny shrubland, with potentially large effects on native fauna
- The ephemeral wetlands of northern Australia are considered at risk, as infestations eliminate or reduce open water areas and may spread for several kilometres across floodplains. These wetlands are waterbird habitats of national significance, as they provide refuges and breeding grounds and they may buffer against drought and habitat losses in other areas of Australia
- Watercourse infestations can cause stream course alteration in subsequent floods by diverting the water flow contributing to erosion and inhibiting flood mitigation
- Feral pigs protected by thickets are free to damage vegetation / livestock in the vicinity
- Parkinsonia is a recognised environmental threat in three bioregions of Queensland: the Gulf Plains, Mitchell grass downs and Mulga Lands. The Desert Uplands and the Kimberley and Pilbara riparian systems in Western Australia. In Queensland it is of concern in 16 conservation areas: 1 threatened plant community, 1 important wetland, 7

reserves in North region, 3 in the Central coast region and 4 in Southwest region. The species is present in the Millstream-Chichester and Hamersley Range National Parks in WA. Found in Kakadu National Park it is recognised as a significant threat to many bioregions of the Northern Territory.

- Areas at risk include the Lake Eyre and Murray-Darling basins, Cape York areas in Queensland and the seasonal blue-bush swamps of the Barkly Tablelands (NT).

#### Primary Production:

- Increased difficulty and expense of mustering
- Impede movement / access to water by stock
- Increased water loss from, and maintenance cost of, watering points
- Reduced pasture production and carrying capacity lowering cattle and wool production
- Exacerbates and accelerates soil erosion.

#### Tourism:

- The riparian areas of northern Australia's river systems are one of the most attractive and characteristic of the outback. The value of the outback tourism industry is increasing and Parkinsonia infestations reduce this natural attraction.

#### Beneficial:

- Some landholders value the role of this species in stabilising creek banks and in the nitrogen added to the soil.

### 1.4 Legislative controls

Parkinsonia is declared in 5 states:

- Queensland: Category P2/P3 (according to regions) - plants are to be destroyed or populations reduced
- Northern Territory: Category B - growth and spread to be controlled
- Western Australia: Category P1/P2/P4 (according to regions) - prevention of trade, sale or movement/eradicate when found/contained where established
- South Australia: Category N# - plants must be notified and destroyed

- New South Wales: Category W1 - plants must be notified and destroyed (applicable to six local government areas in the NW of the state).

Parkinsonia is currently permitted import into Australia by the Australian Quarantine and Inspection Service.

### 1.5 Control to date

Research into Parkinsonia control began as early as the 1950's. The first recommendation was the use of 1% 2,4,5-T in diesel. This was the standard method of control in all areas of infestations on properties and government reserves, until the chemical's demise in the early 1990's. In addition to this, some landholders utilised fire and mechanical control. As the problem became more serious, government officers undertook inspections of outbreaks and advised on control methods. Research on chemical and biological control methods began in early-1980's.

Funding has recently become available for more intense control of Parkinsonia infestations, undertaken by States and concerned groups. In Queensland a total of \$233,706 has been spent on eight SWEEP projects in five shires between 1995 and 1998. A group of independent landholders combined to suppress an infestation in central Queensland (see box). In other states, similar programs have taken place, initiated by the Declared Plant and Animal Control Fund in Western Australia and the Northern Animal and Plant Control Board in South Australia. These costs have been divided between State governments, local governments, private landholders and other organisations. In Northern Territory, landholders are eligible for a 50% subsidy on herbicides for Parkinsonia control and NTDPIC is currently developing a strategic management plan for Parkinsonia. In New South Wales, detected infestations have been previously controlled.

### The Morinish Landcare Parkinsonia Scheme

**Background:** The Fitzroy River catchment was one of the most densely infested areas of Parkinsonia. Thickets along banks on both sides of the waterway prevented access by stock, as well as reduced pasture production and increase soil erosion. Landholders in the riparian zone grew increasingly concerned over the proliferation of thickets and decided a cooperated action was required. Many resources, such as time, planning and mapping has previously taken place in the name of 'weed management', but little work had been done on the ground.

**The Project:** In 1994/95 the Morinish Landcare Group obtained a grant of \$47,000 from the Drought Landcare Program for the control of

Parkinsonia on the Fitzroy River. Funds were also obtained to employ seven long-term unemployed people, from Department of Employment, Education and Training (DEET), for six months and transport for the same. This gang, with cooperation from the Fitzroy Shire Council and landholders, treated 170 kilometres of river frontage on 33 properties along the Fitzroy River. Remaining funds from the grant were sufficient to purchase and distribute chemical to landholders that was used for follow-up control. Regeneration of infestations was controlled after three resprays.

**Lessons learned:** The success of the scheme can be attributed to the following actions:

1. A committed landholder to lead the project.
2. All stakeholders were consulted (73) by telephone, followed by meetings of five sections of the river. Letters to stakeholders were distributed, with return forms outlining the extent of Parkinsonia infestation and their commitment to the scheme and follow-up. By doing this, confidence in the scheme was gained and a degree of ownership was achieved.
3. The Fitzroy Shire Council provided extensive support, from doing all the paperwork for the DEET workforce, lock-up areas for equipment and chemicals, and extensive support from the Weeds Officer.
4. Hiring a first class supervisor for the DEET workforce.

5. Excellent cooperation from QDNR through the Rural Land Protection Board.
6. The funding obtained from the Drought Landcare Fund that allowed it all to happen.
7. Success was largely due to the commitment of all stakeholders consisting of landholders and all levels of government.

The success of this scheme shows that weeds can be controlled on a regional level. A successfully implemented national strategy will consist of many smaller activities working together towards a common vision. A whole catchment approach is the traditionally accepted strategy for weeds such as *Parkinsonia*, but in many cases, control at the top of catchments is rarely achievable, due to poor accessibility. This scheme has shown that successful control of infestations is possible in areas within catchments, provided follow-up control of reinfestation was undertaken.

Chemical and mechanical methods, grazing management and fire can be used in an integrated control program for *Parkinsonia*. All methods may be effective in particular situations, depending on the density, landform, economics/resources, area covered and the management objectives. Timing is very important for control actions. Some low rainfall seasons may lead to natural mortality while high rainfall seasons result in major recruitment of seedlings. Research is continuing on appropriate control methods of *Parkinsonia*, including cost-effectiveness. In addition, the effect of sparse infestations on pasture is not completely understood, nor the benefit of pasture competition on this weeds growth.

Biological control is potentially the most cost effective management method. The seed-feeding beetles, *Penthobruchus germani* and *Mimosestes ulkei* are presently establishing in infested areas of Queensland and Western Australia. Short-term results show promise, with up to 89% of seeds being destroyed by *P. germani*. Results are commonly significantly lower than this in the majority of situations. A native moth also attacks seeds in areas of central Queensland. In combination with *P. germani* 99.8% of seeds are attacked. The sap-sucking insect, *Rhinacloa callicrates* has not had any obvious impacts to date. Information from the

countries of origin indicates good potential for further biocontrol research including the use of pathogens.

## 1.6 Socio-economic factors affecting management

Landholders often quote the high cost of herbicides and associated labour as an obstacle to control. All control programs require several years of follow-up treatments and many years of vigilance, which increases the cost several fold. The long-term costs may cause control of large dense infestations to be uneconomic. The current poor financial performance of agricultural industries and low land values of infested areas extenuate this.

Control and eradication of infestations must be carried out on Aboriginal land. Replacement of this species in nurseries for outstation dust abatement programs with native or non-invasive exotics is essential.

## 1.7 Principles underlying the plan

This plan is based on the recognition and acceptance of the National Weeds Strategy principles:

1. Weed management is an essential and integral part of the sustainable management of natural resources and the environment, and requires an integrated multidisciplinary approach.
2. Prevention and early intervention are the most cost-effective techniques that can be deployed against weeds.
3. Successful weed management requires a coordinated national approach that involves all levels of government in establishing appropriate legislative, educational and coordination frameworks in partnership with industry, landholders and community.
4. The primary responsibility for weed management rests with landholders/land managers, but collective action is necessary where the problem transcends the capacity of the individual landholder/land manager to address it adequately.

## 1.8 Process followed

The National *Parkinsonia* Strategy was developed after a stakeholder workshop held in Brisbane 2<sup>nd</sup> February 2000. This meeting involved representatives from Western Australia, Northern Territory, New South Wales and Queensland. A draft of the

strategy was distributed widely for consultation and comment and the strategy takes into account feedback from 25 stakeholders from five states who commented on drafts.

### 1.9 Relevance to other strategies

The National Parkinsonia Weed Management Strategy has been established to provide a framework for coordinated management of the weed across the country. To date most

infestations are limited to scattered areas of Western Australia, Northern Territory and Queensland, but Parkinsonia has the potential to become widespread throughout these states, as well as regions of South Australia and New South Wales. The strategy is linked to other national and state resource plans as detailed below.

Scope Scale	Natural Resource Management	Pest Management	Weed Species Management
<b>National</b>	National Strategy for Conservation of Australia's Biological Diversity National Strategy for Ecological Sustainable Development	National Weeds Strategy	Parkinsonia WONS Strategy
<b>State</b>	Queensland Biodiversity and Natural Resource Management Strategy Forest, River, Estuary and Wetland policies	Queensland Weed Strategy Northern Territory Weed Management Strategy New South Wales Weeds Strategy Western Australia Weeds Strategy	Queensland Parkinsonia Operational Policy
<b>Regional</b>	Regional NRM Plans	Central Highlands Pest Management Strategy	
<b>Catchment</b>	Catchment Management Strategies	ICM Pest Management Strategies	Morinish Landcare Parkinsonia Scheme
<b>Local</b>	Landcare and Roadside Conservation Plans Road, rail and utility corridor management plans	Local Government Pest Management Plans (Queensland) Roper River Landcare Group Weed Plan (Northern Territory)	
<b>Property</b>	Property Management Plans	Property Pest Management Plans	

## 2 STRATEGIC PLAN

### VISION

Parkinsonia is confined and its impact reduced to a minimum.

#### 2.1 Co-ordinate management

##### Desired outcome

*Parkinsonia management is coordinated and maintained at a national level*

##### Background

Current and potential Parkinsonia infestations cover very large areas across Australia and so management of this weed requires a nationally co-ordinated community approach. Reducing the impact of Parkinsonia is an integral part of land sustainability, including management of natural vegetation, other aspects of biodiversity, tourism values and Aboriginal land values. Projects addressing these issues should include Parkinsonia management. A national Parkinsonia Management Group (ParkMG) will be established subsequent to the strategy endorsement. The membership will consist of representatives from each state as well as industry, pest advisory groups and environment groups. The group's mission will be to coordinate awareness and management of Parkinsonia and oversee the implementation of the strategy.

A wide range of education activities, brochures, signs and communication activities are required. These are needed for more effective community awareness. Actions are particularly important where the general public observe local governments and gardens growing these species and may be influenced to do the same. Similarly, in permaculture circles, Parkinsonia is being promoted as being beneficial to the environment. It may not be necessary to have these trees removed if the risk of spread is low, but observers must be aware that these are declared weeds.

The resources required to prevent the spread of Parkinsonia and minimise the impacts are large. There is a need to ensure that all available resources are utilised and that all achievements and actions are documented as a measure of progress and success. This is also part of accountability requirements on government and private industry managers to

ensure efficient use of resources. Approaches for funding should be co-ordinated to maximise potential success. This includes ensuring that WONS with similar growth forms, impacts and distributions are managed together. Parkinsonia control should not be considered in isolation from other management activities in a property, region or catchment. Attention should be given to the total requirements of landscape restoration rather than for weed control *per se*. Parkinsonia management should be considered along with other weeds. Further, weed management must be considered as part of property management and coordinated with other activities to maximise the benefits of control. Management on government land is required, as this species occurs in National Parks, reserves and unallocated State land.

Control programs are expensive and require on-going landholder commitment to follow-up. Some disincentives to control include lack of other plant species to stabilise banks, fix nitrogen and suppress dust. Alternative species must be made available. Large information gaps still exist in our understanding of the biology and ecology of Parkinsonia. Research is needed. In all situations, enforcement should be considered as a last resort, with primary emphasis on encouraging landholders through involvement in weed management to provide ownership of the issues and consequent outcomes or problems.

A key component of reducing the impacts of Parkinsonia is a management strategy based on a zonal system. Zoning relates more to the "strategic" importance of the infestation (and local finances) rather than its size and/or density *per se*. This zoning approach will be catchment based, as spread by water is the most important mode of dispersal. The workshop identified three zones:

A - Containment zone: Dense infestations, inaccessible, not strategically important,

B - Active control zone: Medium or strategic infestations, scattered, threaten agriculture or conservation, medium risk of spread, and

C - Eradication zone: Plants scarce or none, high potential for spread, high potential for impact).

The rationale for the Parkinsonia containment zones is that there are three realistic management approaches for Parkinsonia based on current resources and knowledge. This is in contrast to many WONS species, which are considered to have core

infestations and infestations to be eradicated. It was envisioned that with increased resources or new management actions or biological control agents some infestations would move to lower classifications.

Strategy	Actions	Responsibility	Rank
<b>2.1.1 Monitor and evaluate implementation of the strategy</b>	Establish and maintain a Parkinsonia Management Group	All stakeholders	1
	Establish a strategy coordinator	Parkinsonia Management Group	1
	Monitor and evaluate on-ground activities, disseminate results to all states/territories.	State/Territory agencies, local governments, strategy groups	1
	Collate strategic plan milestones and report on progress annually to NWSEC and stakeholders	Parkinsonia Management Group	1
<b>2.1.2 Increase education and awareness of the parkinsonia situation in Australia</b>	Identify stakeholders and direct awareness campaigns to target groups, using case studies where possible	Parkinsonia Management Group, State/Territory agencies	1
	Develop and implement extension and communication plans addressing established and potential Parkinsonia infestations	Parkinsonia Management Group, State/Territory agencies	1
	Produce and distribute identification kit of prickly bushes and alternate plants eg. leaflets on prickly bushes and WEEDdeck	National Weed Awareness Project, State/Territory agencies	1
	Produce and distribute information package (social/environmental/economic management and impacts)	States and territories, NWAP	1
	Promote and coordinate public awareness	Parkinsonia Management Group	2
Recognise the need for conflict negotiation for some control actions and put procedures in place to manage	State/Territory agencies	2	
<b>2.1.3 Maximise the availability of resources and efficiency of use</b>	Seek and maintain adequate resources to assist in ongoing management of Parkinsonia infestations	State/Territory agencies, LGs, landholders	1
	Support ongoing research in ecology and biology, environmental impacts, management and biocontrol	State/Territory agencies, industry, R&D corporations, CSIRO,	1
	Determine criteria for government assistance versus landholder responsibility	Parkinsonia Management Group, State/Territory agencies	1
	Market the strategy and coordinate a planned approach for funding sources	Parkinsonia Management Group, NWAP	1

Strategy	Actions	Responsibility	Rank
	Incorporate Parkinsonia management in: <ul style="list-style-type: none"> <li>landholder level property &amp; sub-catchment plans</li> <li>local government pest management plans</li> <li>Regional natural resource &amp; catchment strategies</li> </ul> Vegetation mapping and planning Establish linkages and joint action with other WONS strategies	State/Territory agencies, strategy groups, LGs, landholders  Parkinsonia Management Group, State/Territory agencies	1  1
	Promote integrated weed management to maximise benefits of Parkinsonia control (while also monitoring associated costs)	State/Territory agencies	1
<b>2.1.4 Identify economic impacts and incentives/disincentives</b>	Determine the benefits and costs of Parkinsonia control for best practice management	State/Territory agencies	1
	Update data on the economic impact of Parkinsonia	State/Territory agencies	2
	Assess the economics of Parkinsonia eradication at different spatial scales including the assessment of specific programs	State/Territory agencies	2
	Review, document and distribute to all stakeholders information on current and potential incentives and disincentives: <ul style="list-style-type: none"> <li>Potential “net” benefit of incentives</li> <li>Impacts on land values/ rates</li> </ul> Forms of assistance available Facilitate removal of identified disincentives	State/Territory agencies	2
	Enforce lease conditions to facilitate Parkinsonia eradication	State/Territory agencies	2
	Develop resource management plans for Government lands in these areas consistent with other plans	State/Territory agencies	2
<b>2.1.5 Use enforcement as a management tool</b>	Ensure states have legislation to support actions in core and scattered infestation areas	Legislative agency in each State and Territory	1
	Utilise support available from cooperative landholders in encouraging others to meet their eradication responsibilities	LGs, strategy groups	1
	Increase landholder awareness of their current responsibilities under legislation	State/Territory agencies, LGs	1
	Utilise enforcement where necessary to ensure control aimed at eradication is achieved	LGs, State/Territory agencies	1
<b>2.1.6 Develop a zonal management plan</b>	Develop criteria and management objectives for zonal classification for Parkinsonia management in consultation with communities	Management Group, State/Territory agencies, CSIRO, LGs and catchment groups	1
	Determine the zones on a catchment basis	Management Group, State/Territory agencies	1
	Map the infestations and the zones and make maps readily available on appropriate levels eg. State/Territory, catchment, regions.	Management Group, State/Territory agencies, LGs, catchment groups	1
	Regularly review the zonal classification system and catchment maps with community input	Management Group, State/Territory agencies	2

## 2.2 Containment

### Desired outcome

*Zone A infestations (Containment zone) are reduced.*

### Background

Areas where only limited management practices are currently economically and technically feasible are defined as Zone A – the Containment zone. This group includes areas where infestations are dense, inaccessible or not strategically important, such as contained catchments or infestations a long way from organised management groups.

Integrated management, including biological control, fencing riparian areas and fire, have the potential to provide cost effective management of large-scale Parkinsonia infestations. There is still potential to improve the effectiveness of control methods for some sites. Biological control agents need to be distributed throughout infestations. Further importation of biological control insects and plant pathogens is possible from newly discovered overseas sources. Insects already released in Australia originate from the United States or Argentina, but recent studies in Nicaragua, which is closer to the weeds centre of origin, revealed many potential agents. Control techniques should not impact on the effectiveness of biological control agents.

Strategy	Actions	Responsibility	Rank
<b>2.2.1</b> <b>Introduce and improve the impact of biological control agents</b>	Maximise distribution and assessment of current biological control agents to all core infested areas of Australia	State/Territory agencies, CSIRO, strategy groups, LGs,	1
	Conduct surveys overseas for insects and pathogens	State agencies, CSIRO	1
	Introduce, assess and distribute new biocontrol agents	CSIRO, State agencies	1
	Determine impacts of introduced biological agents and interrelationships between them and other control options	State/Territory agencies, CSIRO	1
<b>2.2.2</b> <b>Develop integrated weed management techniques</b>	Develop and promote integrated weed management to maximise benefits of Parkinsonia control (also monitor associated costs)	State/Territory agencies	1
	Evaluate the use of fire as a management technique	State/Territory agencies, CSIRO	1
	Survey the presence of Parkinsonia in landscapes and ecosystems and use as an indicator of success of Parkinsonia management	State/Territory agencies, LGs, CSIRO	2

## 2.3 Active control

### Desired outcome

*Zone B infestations (Active control zone) are minimised.*

### Background

The majority of Parkinsonia infestations are scattered, occurring in areas where eradication is not feasible or warranted because of the low risk of spread but they can be managed to minimise the impacts. These are designated Zone B. Management of these areas is targeted at minimising impacts on agriculture and the environment by undertaking active control. In some areas,

distribution of Parkinsonia has reached its limits and management is required to minimise impacts by preventing infilling. Regional and local planning is required.

Integrated weed management, including chemical control, mechanical control, fencing, biocontrol and fire, have the potential to provide cost effective confinement of these medium or strategic Parkinsonia infestations. To aid improvement in ownership of the situation, training and management demonstration sites should be established to demonstrate successful methods of control. The use of adaptive management research “learning while doing” will be important for Parkinsonia. In this research landholder input



to refining control methods and adapting them to local situations is essential to the establishment of best practice management. There is still potential to improve the effectiveness of control methods for some

sites and this effectiveness needs continuous dissemination to landholders. Biological control agents need to be distributed throughout infestations. Control methods should be complementary.

Strategy	Actions	Responsibility	Rank
<b>2.3.1 Promote the integration of Parkinsonia management</b>	Develop and promote integrated weed management to maximise benefits of Parkinsonia control (also monitor associated costs)	State/Territory agencies	1
	Survey the health of landscape and ecosystems and use as an indicator of success of Parkinsonia management	State/Territory agencies, CSIRO	2
	Incorporate Parkinsonia management within overall weed management in property planning Develop a weed planning module for use in the property planning process	Landholders State/Territory agencies, LGs	2 2
<b>2.3.2 Develop, refine and adopt integrated weed management techniques</b>	Publish best practice options for Parkinsonia management	State/Territory agencies	1
	Evaluate and develop effective integrated control techniques, including control for riparian areas	State/Territory agencies, CSIRO	1
	Encourage and support on-ground control of infestations	State/Territory agencies, LGs	1
	Use adaptive management to refine best practice for different regions and types of infestations	State/Territory agencies, LGs, strategy groups, landholders	1
	Establish best practice demonstration sites and conduct training in management techniques	State/Territory agencies, strategy groups	2
<b>2.3.3 Identify and prioritise areas for different management regimes</b>	Maximise distribution of biological control agents and integrate with other control options	State/Territory agencies, CSIRO	2
	Develop improved understanding of seed biology, plant ecology and environmental impacts	State/Territory agencies, CSIRO	2
	Develop criteria for prioritising areas, including the establishment of clean areas within the core areas of infestation	State/Territory agencies, LG, landholders, catchment groups	1
	Prioritise areas in each catchment	State/Territory agencies, LG, landholders, catchment groups	1
	Plan actions for each infestation including confinement plans according to risk of spread	State/Territory agencies, LG, landholders, catchment groups	1

## 2.4 Eradicate and prevent spread

### Desired outcome

*Zone C infestations (Eradication zone) are eradicated and new introductions of Parkinsonia are prevented.*

### Background

The present scarcity of Parkinsonia infestations in particularly sensitive areas of Australia, combined with the enormous potential of impacts and costs of widespread infestations, is an incentive to actively seek to eradicate all detected Parkinsonia in some areas. Zone C was considered the eradication zone. A determined approach is necessary by all stakeholders to achieve this. This strategy outlines that all infestations within Zone C need to undergo continuous control activities in order to achieve this and be tackled locally on an appropriate scale (eg. sub-catchment).

Information on the distribution of Parkinsonia, including where control works have been completed, is critical to support planning. The degree of detail required would vary with the scale and purpose of the planning e.g. planning in eradication areas with scattered plants requires knowledge down to single plant level. Advanced methods of obtaining data, such as remote sensing and aerial

techniques need to be developed and applied. Collection of landholder mapping data will significantly add to the current data set.

Vast areas of Australia are at risk of infestation by Parkinsonia. Seeds should be prevented from spreading to unaffected areas. A key component of this is early detection of plants in areas outside infested areas. It is important that those areas are prioritised and regular surveys carried out, particularly following major rainfall events. Assistance is needed from the industries and communities throughout Australia to prevent spread and to detect new infestations. State and local authorities must establish relevant procedures for responding to new infestations and have the resources to promptly eradicate.

There is potential for other *Parkinsonia* species to be introduced into Australia for various uses. This species should be declared under legislation to prevent its distribution in all states and to prevent its introduction into Australia. Similarly, in certain permaculture and nursery circles, Parkinsonia is being promoted as being beneficial to the environment and is being planted in remote areas for the purposes of dust suppression.

Strategy	Actions	Responsibility	Rank
<b>2.4.1 Eradicate infestations in Zone C</b>	Treat infestations using appropriate control techniques	State/Territory agencies, LGs, strategy groups, landholders	1
	Regularly inspect treated areas for regeneration after major rainfall events	State/Territory agencies, LGs, strategy groups, landholders	1
	Provide assistance and resources for effective follow-up: <ul style="list-style-type: none"> <li>• Suitable control of seedling recruitment</li> <li>• Appropriate methods of control</li> </ul>	State/Territory agencies, LGs	1
	Record infestations treated and monitoring programs	State/Territory agencies	2
<b>2.4.2 Develop and maintain early detection and eradication mechanisms</b>	Develop and implement an early detection mechanism and implement regular surveys, including information on identification of the species	State/Territory agencies, LGs, strategy groups, landholders	1
	Establish state-based procedures for receiving and responding to reports of new infestations, including specimens in state herbaria	State/Territory agencies, LGs	1
	Maintain an early eradication capacity	State/Territory agencies, LGs	1
	Implement surveys of high risk areas following major flood events	State/Territory agencies, LGs, landholders	2
<b>2.4.3 Prohibit importation, trade and distribution of Parkinsonia</b>	Prevent importation of Parkinsonia into Australia	AQIS	1
	Declare Parkinsonia to prevent propagation, cultivation and sale in all States and Territories	Regulatory authorities in each State and Territory	1
	Promote alternative species for shade and dust suppression	State/Territory agencies, LGs	2

### 3 MONITORING AND EVALUATION

This strategy is subject to a 5-year cycle of review. The national Parkinsonia Weed Management Group, as a component of its meetings will monitor the implementation of the plan. Annual reports will be forwarded to the NWSEC and made available to interest groups in a cost efficient manner, possibly a web page. Reports will be forwarded to the National Weed Program, if funds are made available from this source. Monitoring will include review of actions outlined and undertaken in:

- State weed strategies
- Queensland local government pest management plans
- Catchment management plans
- Project plans developed from the strategic plan
- State of the Environment reporting processes.

Performance indicators for the plan include:

- National declaration of Parkinsonia
- Increased awareness of Parkinsonia as a weed of national significance
- Increased information exchange between states on control activities and research
- Clear understanding of the social, economic and environmental impacts of Parkinsonia
- Increased delivery of extension material specific to target groups and sites
- Integration of Parkinsonia management into relevant plans and actions
- Increased surveys and eradication of isolated infestations of Parkinsonia
- Decrease in distribution of scattered Parkinsonia infestations
- Increase in management of large scale, medium and strategic infestations and decreased impacts
- Increased resources for on-ground actions
- Increased action on Parkinsonia at all levels- property, catchment and regional
- Progress on removal of disincentives for control of Parkinsonia
- Increased awareness of best management practices
- Increased survey of the conservation status and health of riparian and floodplain areas

## 4 STAKEHOLDER RESPONSIBILITIES

### Private landholders

To control Parkinsonia on their own lands and eliminate spread to surrounding lands including:

- Property management plans to include Parkinsonia control
- Implement best practice management for Parkinsonia
- Eradicate small strategic infestations.

To be aware of the potential for Parkinsonia to spread onto their own lands

- Follow good hygiene practices eg. clean mud and/or seed from animals, footwear and machinery
- Be able to identify Parkinsonia and other woody weeds.

### Local Governments

Ensure impacts of Parkinsonia are kept to a minimum throughout the local government area:

- Ensuring that pest management plans include strategic Parkinsonia control activities
- Ensuring that strategic Parkinsonia control is undertaken on all lands under the local authorities control including stock-routes, roadsides and town commons. Survey commons/reserves infested – map location and density
- Ensuring that all private landholders engage in strategic Parkinsonia control activities
- Liaising with government departments and community groups to undertake strategic Parkinsonia control
- Administering and enforcing the provisions of the relevant acts including notices
- Take an active role in ICM strategies and Landcare activities
- Recognise need for resource allocation on determined priorities for Parkinsonia control
- Train other sections of local authorities on weed issues eg. environmental health officers.

### Utility companies /Agribusiness / Industry

- Develop protocols and washdown facilities
- Ensure awareness of characteristic of the weed

- Become involved in management plans in service regions.
- Alert agencies of new infestations
- Provide input into mapping exercises.

### QDNR/ NTDFIF/ AgWA/ NSWAg/ APCC

To ensure that the social, economic and environmental impacts of Parkinsonia are kept to a minimum throughout the State by:

- Continuing to develop efficient, effective, and appropriate control techniques
- Providing extension and education services to both rural and urban communities
- Developing best practice management under adaptive management programs
- Support local government enforcement of controls of Parkinsonia under the Act
- Liaising with community and industry groups and local governments to coordinate local Parkinsonia control activities
- Facilitating and coordinating Parkinsonia eradication in areas outside of the Parkinsonia containment line.

### Other Government Departments in States

- To assist in development of codes of practice and ensure uptake by departmental staff
- To ensure Parkinsonia control is undertaken on all State managed lands.
- Ensure awareness of characteristic of the weed

### Other States and Territories

- To ensure awareness and early detection programs are put in place
- To eradicate isolated infestations when found
- To declare Parkinsonia in all states.

### **Federal government agencies**

- Ensure quarantine controls on entry of Parkinsonia (Australian Quarantine and Inspection Service)
- Ensure uptake by departmental staff to restrict movement of weeds (agencies that manage land and travel on non-government land)
- Ensure Parkinsonia control is undertaken on all federally managed lands (Defence, Environment Australia and other Commonwealth departments/corporations that manage land)
- Oversee and manage federal funds including Natural Heritage Trust and National Weed Program (Environment Australia, Agriculture, Forestry and Fisheries – Australia).

## 5 ADDITIONAL READING

**Akers D Cummings J Carsten K Hutton T Jeffrey P Panetta D and Donnelly G** 1990 An Assessment of the Pest Status of *Parkinsonia* (*Parkinsonia aculeata*) and Recommendations for its Control in Queensland. Queensland Department of Natural Resources

**Cochard R** 1999 A Seed Ecology Study of *Parkinsonia aculeata* L. Thesis submitted for Bachelor of Applied Science with Honours at James Cook University of North Queensland

**Parsons WT and Cuthbertson EG** 1992 Noxious Weeds of Australia. Inkata Press, Melbourne

**Woods W** 1992 Phytophagous insects collected from *Parkinsonia aculeata* in the Sonoran Desert region of the southwestern United States and Mexico. *Entomophaga* 37(3): 465-474

**Woods W** 1985 Bruchid seed beetles for control of *Parkinsonia aculeata* in Australia. Proc VI int. Symp. Biol. Control of weeds, 19-25 August 1984. Vancouver Canada Delfosse ES (Ed) Agric Can. Pp.855-862.

## 6 GLOSSARY

<b>AgWA</b>	Western Australia Agriculture.
<b>APCC</b>	Animal and Plant Control Commission of South Australia
<b>AQIS</b>	Australian Quarantine and Inspection Service
<b>CLIMEX</b>	A simulation modelling system developed by CSIRO
<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation
<b>ICM</b>	Integrated Catchment Management
<b>LG</b>	Local government
<b>NSWAg</b>	New South Wales Agriculture
<b>NRM</b>	Natural Resource Management
<b>NT</b>	Northern Territory
<b>NTDPIF</b>	Northern Territory Department of Primary Industries and Fisheries
<b>NWAP</b>	National Weed Awareness Project
<b>NWSEC</b>	National Weed Strategy Executive Committee
<b>ParkMG</b>	Parkinsonia Management Group
<b>QDNR</b>	Queensland Department of Natural Resources
<b>SWEEP</b>	Strategic Weed Eradication and Education Program
<b>WA</b>	Western Australia
<b>WONS</b>	Weeds of National Significance