INVASIVE ALIEN SPECIES CLEARING GUIDELINES

FOR THE
UPPER PALMIET RIVER CATCHMENT

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CLIENT:

GROENLAND WATER USERS ASSOCIATION

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WETLAND SOLUTIONS

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1. WHY CLEAR INVASIVE ALIEN PLANTS FROM RIVER CORRIDORS AND WETLANDS?

The impacts of invasive alien plant species on terrestrial and freshwater ecosystems in South Africa have been widely researched and well documented. Indeed, alien plants species are considered among the principal threats to biodiversity in South Africa (Rouget et al. 2003; Latimer et al. 2004). However, these impacts are not restricted to biodiversity loss alone, but also extend to the goods and services that healthy, intact ecosystems are able provide. In rivers and wetlands these services include, amongst others: storage and delivery of clean water, fire regulation, nutrient cycling and recreational opportunities.

An essential component of a functioning river system is the riparian zone. This is the corridor of land along the river banks at the interface between the aquatic and terrestrial environments. Riparian zones may be very broad in cases where floodplains are present, or narrow where the river is confined by steeper banks. Species typical of the riparian zone differ from those that are found in the terrestrial zone. In the Cape Floristic Region (CFR), these species often include: wild almond (Brabejun stellatifolium), Cape silver oak (Brachylaena neriifolia) and the lance leaf myrtle (Metrosideros angustifolia). Palmiet (Prionium serratum) is a distinctive vegetation type found along many river margins in the Western Cape – most notably the Palmiet River to which the plant lends its name. Palmiet is a good example of a riparian species that is known to provide ecosystem goods and services by improving water quality, stabilizing banks and attenuating floods.

Riparian belts in the Western Cape are under threat. They are particularly susceptible to invasion by invasive alien plant species and where this has taken place, it almost always results in the complete replacement of the indigenous by the alien species. In a short period of time, a complex, diverse ecosystem that has evolved at the interface of land and water is replaced by one or two species that don't support the same levels of biodiversity, or provide the goods and services that the indigenous species did. This gives rise to complex physical, chemical and biological changes that extend into the river itself. These changes include increased decomposition and nutrient cycling, physical changes to the river bed and its banks and changes to the quantity and timing of river flows (Richardson and van Wilgen 2004, Chamier et al. 2012).

The increased biomass resulting from invasion by alien woody species increases fire risk and results in hotter, more dangerous fires. These hotter fires destroy natural seed banks and increase water repellency in soils, reducing infiltration and increasing erosion. This, in turn, gives rise to more destructive floods and consequently damage to property and infrastructure (Richardson and van Wilgen 2004). The density of alien plant species also reduces recreational opportunities by eliminating access to the river from its banks.

One of the most harmful ramifications of invasion by large woody species such as the Australian wattles and pines, however, is that they alter the quantity and quality of water delivered downstream. These species have higher transpiration rates than the indigenous Fynbos. This means, less water in the soil, reduced streamflow and reduced yields from dams. In the Western Cape, where water security is becoming increasingly uncertain, the necessity of clearing catchments of alien plant invasions becomes all the more apparent.

However, it is not just rivers and river corridors that are damaged by alien vegetation. At the forefront of any strategy to conserve or restore river systems should be efforts to reinstate the natural functioning of their associated wetlands. In slowing the passage of water through the river system, storing and then releasing it over critical low-flow periods, wetlands play a crucial role in regulating the quantity and timing of water flowing through river catchments. They also play a similarly critical role in improving water quality by removing excess nutrients and pollutants, increasing biological productivity and providing a habitat for wildlife. These ecosystem services become compromised in degraded wetlands that have been transformed by alien plant invasions, agriculture, forestry or urban development.

Whether viewing alien plant invasions of river corridors or wetlands from an economic, social or environmental perspective, it is clearly in everyone's interests that they are halted or reversed where they occur. This document aims to provide best practice guidelines and methods to help you, the landowner, to plan and implement clearing operations along river corridors on your land.

2. OVERVIEW OF INVASIVE ALIEN SPECIES IN THE PALMIET SYSTEM

2.1 Species & Density Distribution

Mapping of invasive alien plants species along the riparian belt of the Palmiet River was undertaking by the Freshwater Consulting Group during the early part of 2012. A list of the most common species that were mapped can be found in Table 2.1. A total of 811 ha (hectares) of land along the banks of the Palmiet River was assessed. Of this, 573 ha (70 %) was estimated as being invaded. Most stands were at a late successionary stage with younger plants associated with newly cleared plots.

Pine plantations by far occupy the largest extent of land adjacent to the Palmiet River (418 ha, Figure 2.1) and most of these are located in the uppermost part of the catchment in the Nuweberg area. The second most dominant group after pines comprised mixed stands of Australian acacia species (Acacia sp.) consisting of rooikrans (*Acacia Cyclops*), long-leafed wattle (*A. longifolia*) and Port Jackson (*A. saligna*) (54 %).

Table 2.1 List of most common invasive alien vegetation species found along the riparian corridor of the Palmiet River.

Botanical Name	Common Name	Invasive Category		Implication for Removal
		CARA	NEMBA proposed	
Acacia cyclops	Rooikrans	2	2	Permit required or controlled
Acacia longifolia	Long - leaved wattle	1	1b	Must be controlled
Acacia mearnsii	Black wattle	2	2	Permit required or controlled
Acacia melanoxylon	Australian blackwood	2	2 in WC 1b rest of SA	
Acacia saligna	Port Jackson	2	1b	
Eucalyptus grandis	Saligna gum	2	1b / 2	
Hakea drupacea	Sweet hakea	1	1a	Must be controlled
Lanana camara	Lantana	1	1b	
Pinus pinaster	Cluster pine	2	2	Permit required or controlled
Pinus radiata	Monterey pine	2	2	
Populus alba	White popular	2	2	
Quercus spp.	Oak	Not listed	Not listed	Best practice is to remove from riparian areas
Rubus cuneifolius	American bramble	1	1b	Must be controlled
Sesbania punicea	Red sesbania	1	1b	
Solanum mauritianum	Bugweed	1	1b	

These consisted of dense stands (>2 m in height) with the highest densities being found immediately upstream of the Peninsula Dam. Other areas where these were particularly dense was downstream of the Arieskraal Dam on the mainstem of the Palmiet River between the confluences of the Huis and Krom Rivers.

Australian gums (predominately *Eucalyptus grandis*) were also common (38 %), with the largest specimens and highest densities being located downstream of the Eikenhof Dam and on land between the Grabouw bridge and the N2 National Highway.

The remainder of the larger tree invaders comprised black wattle (22%) and Australian blackwood (8.4%). These are often found in mixed stands with the other Australian wattles with the black wattle favouring wetter areas closer to the river margins.

In addition the larger tree species, the wet banks and floodplain areas that, under a higher flow regime would have comprised mostly palmiet (*Prionium serratum*) have been invaded by a combination of smaller tree and weed species including sesbania, brambles and lantana.

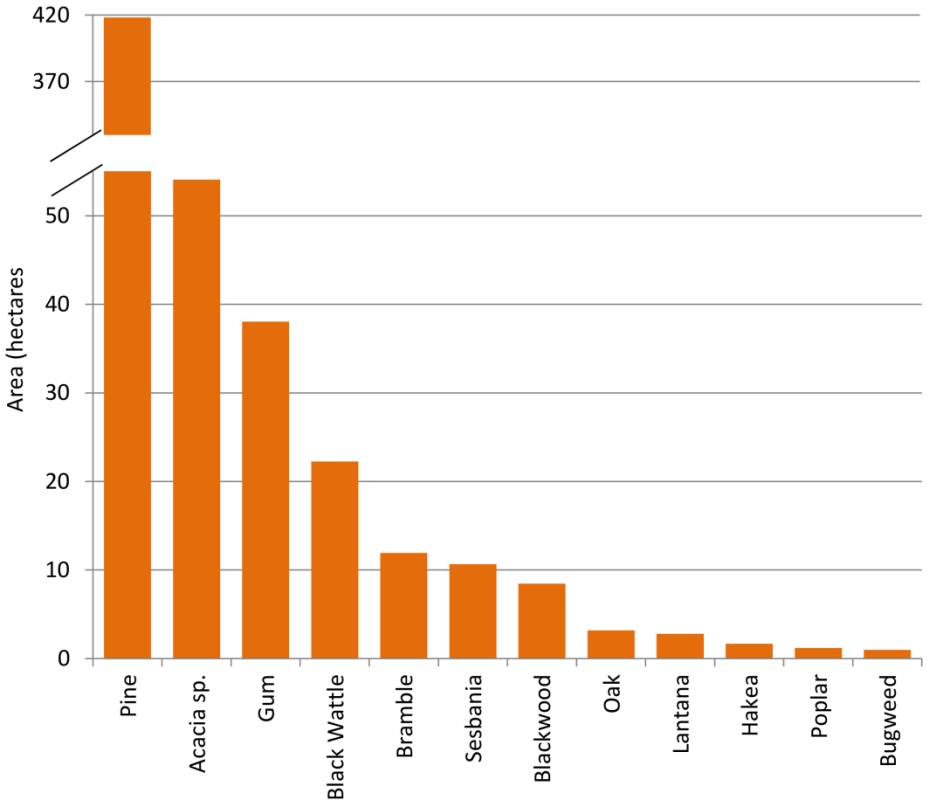

Figure 2.1 Estimated total aerial extent of invasive alien plant species along the Palmiet River (hectares) ordered from highest to lowest densities from surveys undertaken along the riparian belt of the mainstem of the Palmiet River in 2012.

In many instances these occur in mixed stands with palmiet, or have replaced it entirely. Hakea was found to occur in the lower catchment downstream of Arieskraal Dam, but at very low densities compared with the other species.

Note: Although oak is not considered an invasive species, it was included in this survey because where it occurs along the riparian zone it generally encourages erosion and downcutting of river banks.

2.2 Identification of Alien Species and the Law

Currently two pieces of legislation govern the requirement to remove alien species from ones property. CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants and provides removal requirements according to the plant's risk as an invader. This legislation is enforced by the Department of Agriculture and is currently in effect. This list categorises invasive plants as follows:

- **Category 1** - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited

  (e.g. long-leaved wattle, hakea, spider gum, inkberry, sesbania, pittosporum, oleander, stinkbean, lantana, pampas grass, Spanish broom, Spanish reed, pickly pear, canna & several waterweeds)

- **Category 2** – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a landuser must obtain a water use license as these plants consume large quantities of water

  (e.g. rooikrans, Port Jackson, black wattle, blackwood, grey poplar, pine, several gum species, weeping willows, beefwood, sisal, castor oil plant).

- **Category 3** – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold

  (e.g. jacaranda (WC), syringa, manatoka, Brazilian pepper (WC), bottlebrush, cotoneaster, loquat, sword fern & morning glory).

NEMBA (the National Environmental Management Biodiversity Act) in Chapter 5 provides for the publication of Alien and Invasive Species Regulations. The draft regulations were released for public comment in April 2009, but to date has not yet been finalised. This draft list categorises invasive plant species as follows:

- **Category 1a** – Invasive species requiring compulsory control. They have to be eradicated and no permits will be issued.
- **Category 1b** – Invasive species requiring compulsory control as part of an invasive species control programme. Due to their invasiveness, infestations may qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- **Category 2** – These species will be regulated by area. Demarcation permits will be required to import, possess, grow, breed, move, sell, buy or accept as a gift. No permits for riparian areas will be issued.
- **Category 3** – These species will be regulated by activity. Individual plant permits will be required to import, possess, grow, breed, move, sell, buy or accept as a gift. No permits for riparian areas will be issued.

Refer to Appendix 1 for a full listing of declared invasive plant species in South Africa. The table provides the categories for both CARA listed plants as well as the corresponding proposed NEMBA category.

3. PLANNING ALIEN CLEARING OPERATIONS

All alien control programs need to be viewed as long-term management projects. In order to save time, money and effort it is essential to draw up a clearing plan that details the both the **initial** clearing exercise and includes **follow up** actions for rehabilitation of the cleared area.

3.1 Preparing a Clearing Plan

A clearing plan should include the following:

- A map showing the age or size and density of the dominant alien species in the area. The area should be broken into logical blocks or polygons. Any natural or other desirable vegetation, such as field or pastures, should also be indicated. This will help with deciding what clearing methods to use and how to manage the work site.
- Each block should indicate the species and clearing methods to be used.
- An estimate of the number of person days needed to clear each block is useful when planning tasks of work and preparing a budget. See Table 3.1 below for a guideline to estimating person days. The norm can be used for 100% dense stands and must therefore be adjusted in accordance with the density of each block.
- A target start date for clearing each block will assist to schedule tasks of the teams to be deployed in each of the blocks. It will also help to ensure that clearing takes place in the optimal season, which is generally the drier summer months in the Western Cape. Although clearing can be undertaken during winter, site management needs to be more rigorous when working in riparian areas to prevent injury to personnel, damage to property and environmental damage. Herbicide application should never be undertaken in wet and rainy conditions.

Table 3.1 Clearing Person Day / Hectare norms for riparian areas

Specie Class	**Specie examples identified in the Palmiet system**	**Size**	**Clearing Method**	**Person Days/Ha** Initial & Follow-up (at 100% density)
Seedlings	All species	Young	Foliar	5.10
Seedlings		Young	Handpull	6.38
Non-sprouting Trees	Pines, Hakea, Rooikrans	Young	Lopping/Pruning	15.56
Non-sprouting Trees		Adult	Frilling	13.69
Non-sprouting Trees		Adult	Felling (Cut Stump)	25.50
Sprouting Trees	Wattles (Acacia spp), Gums, Sesbania, Poplars, Stink Bean, Brazilian Pepper, Bugweed, Oak, Manatoka, Beefwood, Willow	Young	Lopping/Pruning	22.50
Sprouting Trees		Adult	Frilling	19.84
Sprouting Trees		Adult	Felling (Cut Stump)	36.98
Herbacious Spp.	Brambles, Lantana, Solanum, Inkberry	Young	Foliar	6.38
Herbacious Spp.		Adult	Cut & Spray	15.56
Grass Spp.	incl Pampas Grass & Spanish Reed	Young	Foliar	5.10
Grass Spp.		Adult	Cut & Spray	10.37

Note: This table was summarized from the Working for Water AIP spreadsheets developed by Heinrich Neethling

3.2 Prioritisation and Work Scheduling

When scheduling clearing work consider the following:

- Focus initial clearing efforts in areas where follow-ups can be guaranteed. Leave the areas where long-term management is not feasible.
- Start clearing the lighter infested areas first i.e. those with young/immature, less dense trees which have smaller seed banks and a potentially high rate of spread, such as seedlings after a fire. This will prevent the buildup of seed banks. Starting with less dense areas will require fewer resources and have greatest impact in the long term.
- The second priority area should be along rivers as alien plants tend to spread rapidly in riparian areas. Prioritise these areas in order of increasing density. In these cases it is ideal to start in the headwaters and move downstream to limit the source of re-infestation.
- Ideally dense mature stands should be left for last, as they will not significantly increase in density or pose a greater threat than at present.
- Consider leaving blocks that require active restoration until the restoration materials (seed/plants/stabilising) are available, to avoid soil loss through erosion or re-invasion.
- Aim to clear blocks before they set seed, and clear emerging or new species in a particular before they have a chance to spread.
- Prioritise invasions in natural areas before those in transformed landscapes such as fields.
- If bio-control agents are active in the area, some refuges (uncleared areas) may need to be left to ensure their continued survival.
- Working in riparian or wetland areas during the rainy season is ill advised due to the potential hazard high water tables and potential floods pose. Herbicide application should never be undertaken during or directly before rain events as it will not have sufficient time to be absorbed by the plants and may be detrimental in the environment.
- Collective management and planning with adjacent neighbours may allow for more cost effective clearing and maintenance, considering aliens seeds are easily dispersed across boundaries by wind or watercourses. This will be particularly pertinent when embarking on a clearing exercise within a catchment such as the Palmiet. Co-ordination of effort and collective mapping of clearing operations will assist to prioritise both initial and follow-up work. It may also assist to pool resources to address the priority areas.
- Re-evaluate the prioritising and work schedule from time to time to assess whether it is still the most optimum solution. Regular monitoring of the growth in each of the blocks in the clearing plan needs to inform this process. It will be critical to do this after an event such as fire or a flood.

3.3 Budgeting

When putting together a budget for clearing, make sure the following aspects are considered:

- Vegetation — species composition, density, area coverage, growth stage & location
- Terrain — steepness of slope, accessibility, transport, methods and equipment needed
- Labour — skilled or unskilled, number, task rate (person-days/ha), unit cost per person (including camping or accommodation if needed) and availability
- Method — chemical or mechanical
- Equipment — maintenance and cost
- Herbicide — type, cost, surrounding environment, climatic factors
- Programme — total cost, duration, number of follow-ups needed

3.4 Selection of Clearing Methods

When selecting clearing methods consider the following:

- Consider the role of fire in alien clearing operations. Fire with the appropriate management is a cost effective clearing method and it can be used to get rid of brushwood and even stimulate the growth of seedlings to assist with simplifying follow-up operations. i.e. foliar spraying of seedlings is logistically simpler and cheaper than clearing larger trees. If fire is used as part of the clearing plan, timeous manual follow-up of seedling regrowth is critical.
- Biological control is cost-effective and very safe compared with the expense and risks associated with herbicide use. It can also be successfully integrated in other management practices. If biocontrol is utilised it may be necessary to retain some uncleared stands of the host species to ensure the long-term survival of the biocontrol agent. The local Working for Water representative should be contacted for supply of biocontrol agents and advice as to long term management strategies (see contact List in Appendix 2).

3.5 Planning for Rehabilitation

- Establishing indigenous vegetation cover in cleared areas is key to long term control of alien plant infestations.
- Where the possibility of erosion exists rehabilitation should be carried out. The advice of an expert should be sought if necessary. See contact list in Appendix 2.
- Areas that do not recover naturally following clearing are those that have experienced more than there fire cycles under invasion, or areas that have formed closed stands for more than 30 years, particularly by resprouting species like wattles and gums. These are the areas that need to be targeted for active restoration.

3.6 Monitoring

- Data collected as part of the planning phase will establish a baseline before clearing commences. Progress should be measured against this baseline starting condition.
- Clearing actions carried out per block should be monitored and documented to keep track of which areas are due for follow-up clearing.
- Mapping and dating cleared blocks as they are completed is a useful tool in prioritizing follow-up work. Should a collective approach to clearing within a catchment be undertaken, this will be a critical step to ensure that follow-up work is optimized.
- Ensure that the cleared site is revisited on a regular basis, 6 monthly at a minimum, following the completion of the initial clear to monitor the regrowth. This will ensure a timely follow-up can be initiated to reduce costs.

Before embarking on a monitoring programme, ensure that the following is clear:

- Who will do the monitoring
- How often it will be undertaken
- What variables will be monitored (percentage cover, height of seedlings etc)
- What methods will be used (visual, photographic or more scientific methods)
- How the data will be stored (spreadsheets, maps, photographs or a combination these)
- How the data will be utilised (when will the data be interrogated, i.e. planning the follow up work)

4. BEST PRACTICE GUIDELINES – CLEARING METHODS

4.1 Clearing in Riparian Areas

- Remove biomass wherever possible and never stack in the floodplain. Use 30m away from the riverbank as a general rule, where the floodline is not known.
- Where the removal of biomass is not possible due to the difficulty of terrain or remoteness of the area, consider the following options:
  - Burning the biomass before the next rainy season. (This might be the most damaging option in terms of natural regeneration).
  - Kill standing by ringbarking or frilling trees. Burning dead standing trees results in less heat damage to soil. However, standing trees in danger of falling into water courses should be removed to limit ecological impacts on the river morphology and so that they don't cause blockages which may result in flooding and damage to infrastructure.
  - Combine killing trees standing, felling of smaller trees, or 50% of the stand, and burning. This option also will result in less heat damage to soil.
- Only use herbicides approved for use in wet areas. Never wash equipment or dispose of waste spray mixture in or near water courses where contamination of the water can occur.

4.2 Disposal of Bio-Mass

- Where possible harvest and remove the utilizable wood. Ensure that cut stumps are treated with herbicide as commercial operators often don't apply herbicide. Manage the extraction of the wood to minimise damage to indigenous vegetation and river banks. Limiting access points, for example, would achieve this.
- If burning of brushwood is planned it should be spread rather than stacked.
- If there is a wildfire danger, unusable trees should rather be left standing to reduce the intensity of the fire.
- Where complete removal of biomass is not possible, remove larger-diameter biomass (>5cm diameter woody stems), and stack the remaining finer material on rocky areas or sandy soil in heaps no wider than 3m and 1.5m high. They should be at least 4m apart to facilitate stack burning if required. Burning of these stacks should only take place in cool conditions when the soil is moist. Stacks can also be fed with slash during the burn to decrease burn areas.
- Another option for areas where biomass removal is difficult is to kill the trees standing by ringbarking or frilling. Burn the area just before the next rainy season. To optimize the effectiveness of this option, the burn must be hot enough to burn most of the biomass away or follow-up might be difficult due to the remaining charcoaled stumps. To assist with ensuring that the heat of the burn is adequate, the smaller trees or 50% of the stand can be felled to create enough slash to fuel the fire. Burn only in cool conditions when the soil is moist.
- Where biomass can be removed but the stands are large and very dense, consider a phased approach. Thin the block over a period of time or alternate cleared and uncleared blocks to encourage indigenous regrowth in the cleared blocks.
- Removal of biomass in riparian areas must be undertaken before the next flood event to minimise potential damage.

4.3 Clearing of Alien Grasses

Alien grasses often out-compete indigenous annuals and bulb species that make up an important part of the species diversity in renosterveld and fynbos. They also tend to change the fuel load of the veld causing more frequent and hotter fires, which can also be detrimental to biodiversity and the delivery of ecosystem services.

Some common alien grass species include: Wild oats; Italian ryegrass; Quaking grass; Kikuyu; Ripgut brome; and Rats Tail Fescue.

When combating grass invasion apply the following principles:

- Burning is generally not an effective means of control as it stimulates alien grasses.
- Hand clearing is also not recommended as it disturbs the soil, also stimulating growth.
- Applying a pre-emergent, systemic herbicide has been found to be the most effective control method such as Snapshot, Gallant Super, Fusilade. Mamba & Round-up can be used for controlling Kikuyu.
- Where other desired vegetation exists use a selective herbicide such as Focus Ultra.
- Do not apply herbicide in wet conditions or in wetland areas during winter when the water table is high.

4.4 Safety and Site Management

- Avoid using machines (brushcutters and chainsaws) or make fires in high fire prone areas on hot summer days where the possibility of sparks may be high.
- Utilise techniques that minimise the amount of equipment transportation and use of chemicals in inaccessible areas i.e. in mountainous areas or where there are no roads.
- Avoid damage to indigenous or other desirable vegetation through good site management practices during the clearing operation. This will include the correct choice of vehicle and pedestrian access routes, stacking areas, placement of herbicide and equipment storage areas, and by selecting clearing techniques and herbicides that will have the least effect on non-target vegetation.
- Exercise caution when accessing the clearing site. Use established roads wherever possible and avoid making new tracks. Limit trampling of paths in wet areas or on steep slopes where the possibility of erosion is high.
- Good management of the work and campsite area will include ensuring that herbicide and drinking water containers are clearly labeled and kept in demarcated areas. Campsites should be located outside of riparian areas and off steep slopes. All litter should be removed on a daily basis.
- Ablution facilities should be provided where possible. Should the spade system be necessary, ablutions should be carried out away from water sources.
- Safe working distances between machine operators and general workers must be maintained at all times to minimise injury by chainsaws or brushcutters.
- Personal Protective Equipment (PPE) appropriate to the task at hand should be used (e.g. for hand pulling suitable gloves are required, for chainsaw work safety gear must include a helmet with ear muffs, safety pants, safety boots & eye protection is needed).
- Tools should be transported to work sites separately from people, use trailers or toolboxes.
- A first aid kit should be available on site at all times.

4.5 Recommended Clearing Methods by Vegetation Class

Table 4.1 Clearing Methods applicable to various classes of vegetation

Eradication Option	Density	Method
Grasses		
Foliar application		Use a spray pack with an adjustable nozzle kept as close to the plant as possible to prevent spray drift. In long grass ensure that the blades at ground level also come into contact with the herbicide.
Seedlings		
Hand pulling / hoeing	Sparse stands or sensitive environments	Plants are pulled out either by hand or using a tree popper. This is the most preferred method of control. Plants MUST be pulled out roots and all for this method to be effective. Minimise soil disturbance to reduce seed germination.
Foliar application	Dense or open stands (no more than waist high) Individual plants	Use fan nozzles in dense stands & fit sprayers with pressure or flow regulators. If other desirable vegetation is present, use selective herbicides or mixes that minimises damage to desirable vegetation. Only spray wet areas in summer. Use solid cone nozzles
Saplings		
Hand pulling / hoeing	Sparse stands or sensitive areas	Remove entire sapling by hand or using a tree popper, or sever below ground. Tree poppers are more suited to small sparse stands or individual plants. Hand pulling should be the preferred method in sensitive environments (rivers, wetlands or in close proximity to indigenous plants)
Foliar application	Dense stands (smaller than waist high)	As per seedlings. Overall application or treatment of individual l plants can be undertaken. Spraying should be restricted to plants waist high or lower with sufficient foliage to carry the applied herbicide to the root system.
Basal stem treatment	Sparse to dense stands	Apply herbicide to the bottom 250mm of the stem. Apply by means of a low pressure, coarse droplet spray from a narrow angle cone nozzle.
Cut stump treatment	1-2cm diameter saplings	Cut stumps, including all side stems and suckers, as low to the ground as practically possible using a lopper. Avoid slashers or pangas which result in an angled cut. Apply herbicide to the cut area as recommended on the label. Apply herbicide by close spray within 3 minutes to minimise regrowth.
Mature trees	*Trees above shoulder height or robust bushes 12-18 months or older* *Adult trees are up to 20cm in diameter / Mature adults 20-40cm in diameter*	
Ring barking	Large diameter trees Dense stands with large bio-mass	Remove bark from the bottom of the stem to a height of 0.75 – 1.0 m. Remove all the bark to below the ground for best results. Where not possible due to crevices or exposed roots, use a combination of basal stem & bark removal. De-bark using bush knives or hatchets prior to herbicide application. Consider treating standing trees as this will remove the problem of having to dispose of felled trees. Where there is a danger of trees falling into water courses they should be cut down and removed. Treat stumps with herbicide.
Frilling or partial frilling	Large trees difficult to cut down	Make cuts through the bark into the sapwood by means of a bush knife or light axe around the circumference of the tree. Apply herbicide to the inside of the cut frill within 3 minutes of frilling.
Basal stem treatment	Thinly barked trees up to a diameter of 100mm	Treat up to 50mm diameter stems to a height of 250mm & stems from 50mm to 100mm to a height of 500mm. Spray the full circumference of the stem with a low pressure coarse droplet spray from a narrow angle, solid cone nozzle. Use only on thinly barked woody trees, reasonably free of mud and dust, and fairly dry. This is effective method to treat saplings, regrowth and multi-stemmed trees and shrubs.
Cut stump treatment	Medium to large diameter trees	Cut stumps, including all side stems and suckers, as low to the ground as practically possible using: • bowsaws or handsaws (2-15 cm diameter stems) • chainsaws (over 15 cm diameter stems) Apply herbicide within 3 minutes the cut area to minimise regrowth. Ensure that **ALL** cut surfaces are treated with herbicide applied using a brush applicator or closely sprayed.

	Stacking of cut material	Stacks should be no less that 5 m apart, 3 m in diameter and 2 m tall. Stack in wind-rows on slopes and in round heaps on flat areas. Utilise existing stacks where possible, but ensure height does not exceed 2m. No stacking should occur within floodplains or wetland areas, or closer than 10m to any tracks, roads, power lines, telephone lines or fences.
Stem injection	Certain cactus species	Inject herbicide directly into pre-made holes in the stem and claydodes of trees using a large syringe or similar. Plants can also be chopped down to ground level. If the stump is sufficiently low no herbicide is required. **All** plant material must be removed and disposed of properly as vegetative reproduction can occur from the smallest pieces.
Ecoplugs	Inaccessible areas	Place plugs directly into the stem of standing trees. Hand drills are often utilised to pre-drill the hole.
Coppicing growth		
Foliar spray		Root coppice from some species (*Populus canescens* & *Acacia dealbata* for example) is rapid and follow-up must be undertaken before the plants are too large to be controlled by foliar spraying. Coppicing stumps must be treated before they reach head height.

4.6 Recommended Clearing Methods per Species

The following table provides an overview of recommended clearing methods for the species already identified in the Palmiet system as part of this study, and those most likely to occur.

Should uncertainty of identification or control methods for any other species arise, advice should be sought. Appendix 2 provides a list of useful contacts in this regard.

The methods described below must be applied in conjunction with the best practice guidelines to ensure optimum control while reducing environmental damage.

Table 4.2 Clearing Methods applicable to species identified in the Palmiet system

Species	Common Name	Clearing Method	Herbicide Registrations & Bio control
Acacia cyclops	Rooikrans	Fell & remove all usable wood for firewood. Follow-up of cleared areas is CRITICAL. Handpull seedlings & saplings where possible to reduce the need for foliar applications.	Foliar & soil applications Newly introduced bio-control.
Acacia saligna	Port Jackson	Fell large trees & sparse stands of saplings. Treat cut stumps. Ringbark or frill trees in inaccessible areas. Use basal stem treatments and foliar applications to seedlings and dense stands of saplings. Foliar spray coppice. Consider retaining stands where bio-control is well established. Never fell, clear mechanically with a bulldozer or burn without immediate follow-up with herbicide.	Foliar, soil & cut stump applications. Bio-control successful
Acacia longifolia	Long leaved wattle		Gall insect bio-control reduces seed set.
Acacia mearnsii	Black wattle		Foliar, soil, basal stem & cut stump available Bio-control available
Acacia melanoxylon	Australian blackwood		Foliar, basal stem & cut stump available
Arundo donax	Spanish reed (& bamboo)	Physical removal must include complete removal of the rhizome. Cut down to ground level, stack & burn. Spray regrowth with a systemic herbicide when new plants reach 1-2m, about 6-8 weeks later. Follow-up is essential for long-term control. Consult herbicide labels for use in wet areas.	Foliar application
Cestrum laevigatum	Ink Berry	Cut & treat stumps, or apply spray basal stem treatments. Remove entire plant if physical methods are employed.	Cut stump.

Eucalyptus grandis	Saligna gum	Fell or ringbark large trees. Seedlings can be foliar sprayed, and they are susceptible to fire.	Soil, foliar, frill and aerial applications
Hakea drupacea	Sweet hakea	Fell and stack to dry for 8 to 12 months. Most of the released seeds will be eaten by rodents, but germinated seedlings will need to be controlled by fire or hand pulling ideally. Old dense stands are extremely flammable and produce very hot fires that destroy all indigenous fauna and flora in the vicinity. Fire will trigger seed release so bare areas are very quickly colonised.	Soil application has been registered but is risky. Biocontrol is successful.
Pinus pinaster	Cluster pine	Ring bark or fell. It is not necessary to treat stumps with herbicide. Remove the usable wood as it has a commercial value. Uproot seedlings when the soil is moist or use a foliar application. In large stands the use of fire to get rid of biomass can be considered.	Tebuthiuron for soil application
Pinus radiata	Monterey pine		
Populus alba	White popular	Large trees should be felled & the entire root system removed. As this is costly & undesirable in a riparian environment, ring-barking is recommended. Systemic herbicides can work, but they do require repeated applications, making follow-up work critical.	Several registrations for cut-stump treatments
Quercus spp.	Oak	Fell, remove and replace with indigenous species. This is particularly important in riparian areas. No herbicide treatment required.	No registration
Myoporum tenuifolium	Manatoka	Fell, remove and replace with indigenous species. Generally herbicide is used on cut stumps.	No registrations
Paraserianthes lophantha	Stinkbean	Seedlings hand pull easily. Cut larger trees close to the ground. If felled correctly or burned it does not coppice readily. Seed regeneration after fire must be controlled by foliar application. Follow-up essential.	Foliar application. Bio-control released but not successful.
Rubus cuneifolius	American bramble	Remove the entire plant and roots where possible. Mechanical clearing with bulldozers or through cultivation can be successful. Foliar applications are most effective in autumn when downward sap movement transports the herbicide to the roots. Gloves are an essential part of PPE.	Foliar & soil application available.
Salix baylonica/fragilis	Weeping / crack willow	Once properly identified, they should be felled and removed. Replacement with indigenous species is recommended. i.e. *Salix mucronata*	No
Solanum mauritianum	Bugweed	Hand-pull young plants. Cut larger plants & treat cut stumps. Mechanical clearing & stacking does dislodge clouds of fine hairs containing toxins which may cause respiratory issues. Issue workers with appropriate PPE. Foliar application is successful, so aim to target these plants before they get too tall. Follow-up treatment is critical when spraying as large numbers of seedlings often emerge under trees that have been killed chemically.	Cut-stump, foliar & soil applications
Lantana camera	Lantana	Clearing is time consuming and expensive. Foliar applications can be expensive & not very effective. Chop out dense bushes and spraying the regrowth in summer to autumn is usually the most effective. Gloves are an essential part of PPE.	Cut stump, foliar & soil application available
Sesbania punicea	Red sesbania	Cutting seems to induce vigorous growth which must be sprayed, ideally after the spring flush when the plants have exhausted their root reserves.	Cut-stump, soil & foliar available. Biocontrol by means of a beetle is very effective.

5. BEST PRACTICE GUIDELINES – HERBICIDE USE

5.1 Choice and Storage of Herbicides

- Use only recognized herbicides and those with the least environmental impact. Mix according to the manufacturer's instructions.
- Herbicide should be stored in a separate building out of the floodplain, and not adjacent to residential or livestock dwelling, or near fodder, fuel or other flammable substances.
- Stores should have adequate lighting and a free flow of air. Running water for sanitation and mixing of herbicide should be available. They should also be easily accessible for delivery and dispatch, and lockable when supervision is not available.
- Material for the containment of spills, fine dry soil, and a broom must be readily available.

5.2 Handling and Decanting of Herbicide Concentrates:

- No decanting of herbicide or fuel or cleaning of equipment should take place in the veld or near waterbodies. These tasks should be performed within workshop areas, on drip-sheets or bunded area to prevent spillage. A $1m^3$sump/$10m^2$ floor space is recommended for this purpose.
- Personnel handling herbicide concentrates must be made fully aware of the precautions to be followed. Never eat, drink or smoke while handling herbicides.
- Suitable protective clothing must be utilised when herbicide is handled. This includes chemical resistant plastic aprons, gloves and eye protection. Adequate hygiene aids such as water, soap, towels and eye wash must also be readily available.
- Suitable equipment must be available to prepare spray mixtures. These include plastic measuring cylinders and beakers, mixing containers (buckets) and funnels.
- Suitable absorbent material such as fine dry sand and cleaning equipment must be available to handle accidental spillages.
- In the case of spillage, the spill must be contained immediately and cleaned up with absorbent material such as fine dry soil. Contaminated material should be disposed of as per manufacturer's instructions. Spillages should be reported to project/farm management.
- Concentrates and mixtures should never be decanted into or be mixed in drinking bottles or other food containers.
- All containers into which herbicides or adjuvant are decanted must be clearly marked and a copy of the original label secured to the container.

5.3 Mixing of Herbicides

- Only sufficient spray mixture that can be used in a day should be prepared at the store before leaving for the field. Left-over mixture should be returned to the store.
- Spray mixtures that cannot be left standing overnight should be safely disposed of as stipulated in the product label. Those that can be left overnight with no adverse effects should be kept and reused to reduce costs and pollution from herbicide and wash water.
- Mixing must take place according to label instructions. Where recommended wetting and spreading agents should be added. Buffering agents are added where alkaline water is used. Dye should be added to all mixtures to ensure no target species are missed.
- Always use clean water for mixing herbicides.

- Adjuvants should be added to the tank as per the label instruction prior to the addition of the herbicides when buffering, and afterwards for wetters and dyes.
- Liquid concentrates should be added to a half full tank which is then topped up.
- Do not mix concentrates together before adding them to the tank. Consult product labels.
- Suitable plastic measuring cylinders, beakers and mixing containers to be used for mixing herbicide. They should be stored separately and labeled for herbicide use only.
- Proper mixing in knapsacks and hand held applicators is difficult, so spray mixtures should be mixed in bulk containers or buckets before pouring into the knapsacks or applicators.
- Spray mixtures should be agitated continuously if recommended. This is essential after they have been standing for a while.

5.4 Application of Herbicides

- Herbicide application should not be undertaken in wet and rainy conditions, when standing water is visible on the site or when active geophytes are visible. Where possible herbicide use should be restricted to the dry summer months when working in riparian areas.
- Apply herbicide directly onto the cut stump **immediately (within 3 minutes)** after cutting/felling/frilling of plants, unless otherwise specified.
- All application equipment must be suited to the task at hand and be in good working order. Dedicated spraybottles should be used for applying herbicide. Makeshift bottles and sponges are to be avoided.
- Prevent area contamination by accurate application and using the minimum amount of herbicide needed to achieve the desired level of control. The use of coarse droplet nozzles to avoid overspray or spray drift onto neighbouring vegetation is recommended. Do not apply herbicide in windy conditions.

5.5 In-Field Safety Precautions

- Spray mixtures must be kept in leak-proof, non-spill containers. The containers should be kept away from personal belongings, foodstuff, drinking water, and eating or living areas.
- Herbicides and application equipment must be carried on a separate vehicle/trailer or in a part of the vehicle isolated from people, food and clothing. They should be secured.
- Vehicles should carry absorbent material, such as fine dry sand, to absorb any spillage.
- On site containers should stand on suitable absorbent material, e.g. a large piece of thick Hessian sack that will absorb minor drips, out of direct sunlight in a cool place.
- Containers must be kept at least 20m away from water bodies or rivers.
- Filling sites should be selected to prevent damage to desirable vegetation and to enable spillage to be cleaned up and disposed of. These sites should be clearly demarcated.
- Spray mixture containers must be clearly labeled and only reused for the same herbicide.
- Application equipment and containers should not be cleaned on site.
- Suitable protective clothing, overalls, rubber boots, gloves and if necessary eye protection must be worn by operators when handling and applying herbicides.
- Basic tools (spanners, screwdrivers, pliers etc) and equipment spares must be available in field to reduce wastage of herbicide and loss of time due to non-functioning equipment.
- Malfunctioning nozzles should be replaced in field. Cleaning to be undertaken in the store using compressed air and water.

5.6 Disposal

- A designated person should be responsible for ensuring safe disposal of containers.
- Empty containers must be destroyed after use and not be used for any other purpose. Under no circumstances should containers be taken home for personal use.
- Empty containers should be returned to the store for safe keeping and disposal.
- Where arrangements have been made containers should be returned to the supplier.
- Triple rinse, puncture, flatten containers to be destroyed, and if suitable, burn.

5.7 Herbicide Selection

For detailed recommendations refer to the Working for Water "*Guide to Control Method and Herbicide Selections for Alien Species*". The table below provides a summary of the most common registered herbicides used.

Table 5.1 Registered herbicides for species identified in the Palmiet system

Application Technique	Species	Active Ingredients	Products	Mixing Ratios
Foliar Spray	*Acacia spp.* *Solanum mauritianum*	Triclopyr - butoxy ethyl ester	Garlon, Triclon, Viroaxe	1 – 1.5 % mix in water + Dye + wetting agent
	Paraserianthes lophantha *Rubus cuneifolius,* *Solanum mauritianum*	Triclopyr + Clopyralid	Confront	
	Grass spp., *Ipomoea spp., Lantana camera, Rubus cuneifolus, Sesbania punicea, Solanum mauritianum*	Glyphosate-isopropylamine	Shaik-Down, Springbok, Touchdown, Mamba, Ridder, Tumbleweed, Focus Ultra	Mix is dependent on required use but is usually between 2 – 4% mix in water + Dye + wetting agent
	Arundo donax, Solanum mauritianum	Glyphosate-sodium salt	Kilo, Kilo max	
Basal Stem	*Cestrum laevigatum*	Triclopyr	Garlon, Viroaxe	1 % in diesel (exercise caution in sensitive environments)
Cut Stump Treatment	*Eucalyptus* spp.	Glyphosate-potassium salt	Roundup turbo	
	Acacia saligna, Populus spp.	Tricopyr - pyridyloxy	Lumberjack, Timbrel	3 % mix in water + Dye + wetting agent
	Acacia mearnsii, Eucalyptus spp., Casuarina equisetifolia, *Cestrum laevigatum, Lantana camera, Populus spp., Sesbania punicea* *Solanum mauritianum*	Imazapyr	Chopper, Hatchet	10% mix in water + Dye + wetter (5ℓ/ha) 2% in water (1.5ℓ/ha)
	Schinus terebinthifolius	Triclopyr - butoxy ethyl ester	Garlon, Viroaxe	5 % mix in water + Dye + wetting agent
Herbicide Injection	*Opuntia* spp.	MSMA	MSMA	50 % water mix
Frilling	*Eucalyptus* spp.	Imazapyr	Chopper, Hatchet	10 % mix in water + Dye + wetting agent

6. OVERVIEW OF AQUATIC INVASIVE SPECIES TREATMENT

Although invasive alien aquatic plants have not been specifically identified in this study, they will occur in most riparian areas in the Western Cape. A very brief outline of recommended control methods has therefore been included. Should aquatic weed species become problematic in the Palmiet system expert advice should be sought. (See Appendix 2 for contact details).

Table 6.1 The most common invasive alien aquatic species

Common name	Scientific name	Growth form	Preferred habitat	Established or emerging weed?	Best control method
Red water fern	*Azolla filiculoides*	Floating, emergent, mat-forming	Open surface water; wetlands or rivers; variable depth – standing water	Established (category 1)	BIO-CONTROL
Rigid hornwort	*Ceratophyllum demersum*	Floating, submerged, but may root to the substrate	Standing or gently flowing open surface water; wetlands or rivers; variable depth	Established	MANUAL (no biocontrol available)
Wandering Jew	*Commelina benghalensis*	Rooted, creeping	Mostly terrestrial, but likes wet areas; Standing or gently flowing wetlands or rivers	Emerging	MANUAL for smaller invasions; CHEMICAL may be effective in the short-term (no biocontrol available)
Brazilian waterweed	*Egeria densa*	Floating, submerged with emergent stems/flowers, forms dense masses	Open surface water; wetlands or rivers; variable depth - Standing or gently flowing	Established (category 1)	MANUAL / MECHANICAL (no biocontrol available)
Water hyacinth	*Eichhornia crassipes*	Mostly floating, emergent, mat-forming, may root in shallow waters	Open surface water; wetlands or rivers; variable depth - Standing or gently flowing	Established (category 1)	BIO-CONTROL; CHEMICAL in combination with other control methods
Willow herb	*Ludwigia adscendens*	Floating or rooted, creeping; mixed with other species	Standing or gently flowing wetlands and river margins	Emerging	MANUAL (no biocontrol available)
Purple loosestrife	*Lythrum salicaria*	Rooted; forms colonies from single root mass	Standing or gently flowing wetlands and river margins	Established (category 1)	MANUAL; CHEMICAL (no biocontrol available)
Parrot's feather	*Myriophyllum aquaticum*	Rooted, emergent	Standing or gently flowing open surface water; wetlands or rivers; variable depth	Established (category 1)	BIO-CONTROL; MANUAL effective only if in conjunction with bio-control
Watercress	*Nasturtium officinale*	Rooted with floating and emergent stems	Standing or gently flowing open surface water; wetlands or rivers; variable depth	Established (category 2)	MANUAL (no biocontrol available)
Persicaria	*Persicaria (*probably *lapathifolia)*	Rooted	Standing or gently flowing river margins	Emerging	MANUAL (no biocontrol available)
Water lettuce	*Pistia statiotes*	Usually floating, emergent, but may root in shallow waters	Standing or gently flowing open surface water; wetlands or rivers; variable depth	Established (category 1)	BIO-CONTROL; MANUAL effective for small invasions; CHEMICAL
Pickerel weed	*Pontederia cordata*	Rooted, emergent, forms dense clumps	Standing or flowing wetlands and river margins	Established (category 3)	MANUAL; CHEMICAL (no biocontrol available)
Kariba weed	*Salvinia molesta*	Floating, emergent, mat-forming	Standing or gently flowing open surface water; wetlands or rivers; variable depth	Established (category 1)	BIO-CONTROL; CHEMICAL

6.1 Manual and mechanical control

Removal by hand is recommended in special cases and is generally only feasible when infestations are small, i.e. less than 1 hectare in extent. Mechanical harvesters tend to be expensive and their use is constrained by water depth and obstructions on the bed and banks of the waterbody. Mechanical control using floating booms or cables is very successful on some rivers or sections of a waterbody. Floating aquatic plants accumulate against the cables and can then be treated with herbicides. The technique is cost effective and reduces the time and cost spent tracking down small, hidden infestations or individual plants. Cables / booms can also be used to cordon off areas where bio-control agents have been introduced.

Best Practice Guidelines:

- Remove all parts of the plant.
- Use manual control in the colder months, when weed reproduction is less vigorous.
- Stockpiled material in a safe area on dry land adjacent to the invaded waterbody for a minimum of several days to dry out and decay, prior to removal to a dump site.
- Follow mechanical removal with manual removal, to ensure all parts of the plant are removed from the waterbody.
- Boom off the area around or downstream of a site in a river to prevent broken off plant material from floating away and to ensure that all parts of the plants are collected.

6.2 Chemical control

Herbicides can be sprayed onto leaves above water surface to control floating and emergent weeds and injected underwater (direct metering) to control submerged plants. Only herbicides that are registered for use on aquatic systems should be used and personnel should be adequately trained on the safe application of these chemicals. When aquatic herbicides are used according to their label specifications, there is minimal toxicity to fish, birds and other aquatic organisms. The chemicals are short-lived and do not accumulate in living organisms.

Table 6.2 Clearing Methods applicable to various classes of vegetation

Active Ingredient	Herbicide products	Action	Cautionary Notes	Species Registered
Diquat (200g/l)	Midstream	Non-selective quick acting contact herbicide; only causes injury to the parts of the plant to which it is applied	General aquatic herbicide that can be applied directly to the plant or foliar application.	Water hyacinth, Salvinia
Glyphosate (240g/l)	Roundup CT Roundup Pro Tumbleweed	Non-selective, water soluble, systemic broad spectrum herbicide	Relatively harmless to aquatic life. Surfactants included with some herbicides are however toxic to bio-control agents. Glyphosate on its own is less detrimental to bio-control than other active ingredients. Apply only to target plant & avoid spraying over open water or in windy conditions	Water hyacinth
Glyphosate (360g/l)	Mamba 360 SL Roundup			
Glyphosate trimesium (480g/l)	Touchdown plus	Non-selective, water soluble, systemic broad spectrum herbicide		
Terbutryn (500g/l)	Igran 500SC Terbutryn SC	Selective, water soluble, systemic, general agricultural & aquatic herbicide	Moderately toxic to fish & slightly toxic to birds. Only apply to the target plant & avoid spraying over open water or in windy conditions	Water hyacinth, water lettuce & Salvinia

Best Practice Guidelines:

- Only use herbicides registered for use on aquatic systems;
- Utilise adequately trained personnel;
- Use according to label specifications to minimise toxicity to fish, birds and other aquatic organisms;
- Only treat 30% of large weed infestations at a time to limit the possibility of fish kills. Decomposition of plants will deplete oxygen, thereby killing fish;
- Leave unsprayed mats of aquatic plants untreated (reserves) if herbicide treatment is being used in conjunction with bio-control, and ensure that these areas are well demarcated or boomed off, and
- Used coloured dye in areas where demarcation is required.

Since environmental conditions are often unpredictable, fish kills can occur following herbicide application to large populations of aquatic plants – decomposition of the plants depletes oxygen and fish die due to low dissolved oxygen availability. Thus large weed infestations should be controlled by a series of herbicide applications to portions (not more than 30%) of the water body over an extended period. Often it is not the active ingredient in the herbicide that is toxic but wetting agents / surfactants which have been added to make the herbicide adhere to the waxy cuticle of the target plants. By training spray operators and following the application guidelines, the impacts of the potentially harmful chemicals on other biota can be greatly limited. If herbicide and biological control methods are integrated on the same system, it is important to leave unsprayed mats of plants, called reserves or refugia, which the biocontrol agents can safely move to. Coloured dye added to spray containers assists with marking and detecting which areas / plants have been previously sprayed.

6.3 Bio-control

Bio-control makes use of natural enemies such as insects or pathogens to control aquatic weeds to manageable levels. Bio-control aims to achieve a balance between populations of the host plant and its natural enemies which are host-specific. Complete eradication of the problem plant is not possible as the agent is entirely dependent on its host plant. Fluctuations in the weed and agent populations are common and become less pronounced once a balance has been achieved between the host and agent. Bio-control agents are available for the "big five" aquatic weeds and are generally considered to be extremely effective at controlling infestations of most of these species.

Aquatic weed	Biocontrol Agent	Type	Mode	Degree of Control	Expected Damage
Azolla filiculoides	*Stenopelmus rufinasus*	Weevil	Leaf feeder	Complete	Extensive
Eichhornia crassipes	*Eccritotarsus catarinensis* *Neochetina bruchi* *Neochetina eichhorniae* *Niphograpta albiguttalis* *Orthogalumna terebrantis*	Mirid Weevil Weevil Moth Mite	Sap sucker Stem borer Stem borer Petiole borer Leaf miner	Substantial	Considerable
Myriophyllum aquaticum	*Lysathia sp.*	Beetle	Leaf feeder	Substantial	Extensive
Pistia stratiotes	*Neohydronomus affinis*	Weevil	Leaf & stem borer	Complete	Considerable
Salvina molesta	*Crytobagous salviniae*	Weevil	Growth tip feeder, rhizome borer	Complete	Extensive

7. REFERENCES

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APPENDIX 1

LISTED ALIEN SPECIES

Listed Invasive Plants under CARA - Conservation of Agricultural Resources Act

Category 1: **Declared Weed** Prohibited and must be controlled

Category 2: **Declared Invader** (commercially used plants)

- May be grown in demarcated areas under controlled conditions
- Import of propagative material and trading allowed only by permit holders

Category 3: **Declared Invader** (ornamentally used plants)

- May no longer be planted and no trade of propagative material is permitted.
- Existing plants may remain, except within 30m of the 1:50 year floodline of watercourses or wetlands, and they must be prevented from spreading.

Proposed List of Invasive Plants under NEMBA - National Environmental Management: Biodiversity Act

Category 1a: Invasive species requiring compulsory control. They have to be eradicated and no permits will be issued.

Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Due to their invasiveness, infestations may qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.

Category 2: These species will be regulated by area. Demarcation permits will be required to import, possess, grow, breed, move, sell, buy or accept as a gift. No permits for riparian areas will be issued.

Category 3 These species will be regulated by activity. Individual plant permits will be required to import, possess, grow, breed, move, sell, buy or accept as a gift. No permits for riparian areas will be issued.

Botanical name	Common name	Type	CARA Category	Proposed NEMBA Category
Acacia baileyana	Bailey's wattle	Invader	3	3
Acacia cylops	Red eye / Rooikrans	Invader	2	2
Acacia dealbata	Silver wattle	Weed	1 in WC, 2 in rest of SA	1b
Acacia decurrens	Green wattle	Invader	2	2 in KZN, MP, EC
Acacia elata	Pepper tree wattle	Invader	3	1b
Acacia implexa	Screw-pod wattle	Weed	1	1a
Acacia longifolia	Long-leaved wattle	Weed	1	1b
Acacia mearnsii	Black wattle	Invader	2	2
Acacia melanoxylon	Australian blackwood	Invader	2	2 in WC; 1b in rest of SA
Acacia paradoxa	Kangaroo wattle	Weed	1	1a
Acacia pendula	Weeping myall		X3	3
Acacia podalyriifolia	Pearl acacia	Invader	3	1b
Acacia pycnatha	Golden wattle	Weed	1	1b
Acacia saligna	Port Jackson willow	Invader	2	1b
Acacia stricta	Hop Wattle		_	1a
Acer buergerianum	Chinese Maple		X3	3
Acer negundo	Box Elder		X3	3
Achyranthes aspera	Burweed / Grootklits	Weed	1	_
Agave americana	Spreading century plant / Garingboom		X2	1b in WC

Agave sisalana	Sisal hemp, sisal	Invader	2	2
Ageratina adenophora	Crofton weed	Weed	1	1b
Ageratina riparia	Mistflower	Weed	1	1b
Ageratum conyzoides	Invading ageratum	Weed	1	1b
Ageratum houstonianum (excluding cultivars)	Mexican ageratum	Weed	1	1b
Agrimonia procera	Scented agrimony		X3	1b
Ailanthus altissima	Tree-of-heaven	Invader	3	_
Albizia julibrissen	Silk Tree		X3	1b
Albizia lebbeck	Lebbeck tree	Weed	1	1b
Albizia procera	False lebbeck	Weed	1	1b
Alhagi maurorum	Camel thorn bush	Weed	1	1b
Alisma plantago-aquatica	Mud plantain		_	1b
Alnus glutinosa	Black alder		X3	3
Alpinia zerumbet	Shell ginger		_	3
Ammophila arenaria	Marram grass		X2	2
Anredera cordifolia	Maderia vine, Bridal wreath	Weed	1	1b
Antigonon leptopus	Coral creeper		_	1b
Araujia sericifera	Moth catcher	Weed	1	1b
Ardisia crenata	Coralberry tree, Coral bush	Weed	1 in NP, KZN & MP	1b
Aridisia elliptica	Shoebutton ardisia		_	1b
Argemone mexicana	Yellow-flowered Mexican poppy	weed	1	1b
Argemone ochroleuca subsp ochroleuca	White-flowered mexican poppy	Weed	1	1b
Aristolochia elegans	Dutchman's Pipe / Sisblom		_	1b
Arundo donax	Giant reed, Spanish reed	Weed	1	1b
Atriplex inflata	Sponge-fruit saltbush		_	1b
Atriplex lindleyi subsp inflata	Sponge-fruit saltbush	Invader	3	_
Atriplex nummularia subsp. nummularia	Old man saltbush	Invader	2	2
Azolla filiculoides	Azolla, red water fern	Weed	1	1b
Azolla pinnata	Mosquito fern		_	1b
Bartlettina sordida	Bartlettina		_	1b
Bauhinia purpurea	Butterfly orchid tree	Invader	3	1b in KZN, LP, MP, EC. 3 in rest of SA
Bauhinia variegata	Orchid tree	Invader	3	1b in KZN, LP, MP, EC. 3 in rest of SA
Berberis thunbergii	Japanese barberry		X3	3
Billardiera heterophylla	Bluebell creeper		_	1a
Brachychiton populneus	Bottle tree		X3	_
Bryophyllum delagoense	Chandelier plant	Weed	1	1b
Bryophullum pinnatum	Cathedral bells		_	1b
Bryophyllum proliferum	Green mother of millions		_	1b
Buddleja davidii	Chinese sagewood		_	3
Buddleja madagascariensis	Madagascar sagewood		_	3
Cabomba caroliniana	Carolina fanwort		_	1a
Caesalpinia decapetala	Mauritius thorn	Weed	1	1b

Caesalpinia gilliesii	Bird-of-paradise flower		_	1b
Callisia repens	Creeping inch plant		_	1b
Callistemon citrinus	Lemon bottlebrush		_	3
Callistemon rigidus	Stiff-leaved bottlebrush		_	1b in WC, EC. 3 in rest of SA.
Callistemon viminalis	Weeping bottlebrush		_	1b in KZN, MP, LP, EC. 3 in rest of SA.
Calotropis procera	Giant-milkweed		_	1b
Campuloclinium macrocephalum	Pom pom weed	Weed	1	1b in GP, NW, LP, MP. 1a in rest of SA.
Canna indica (Excluding hybrid cultivars)	Indian shot	Weed	1	1b
Cardiospermum grandiflorum	Balloon vine	Weed	1	1b
Cardiospermum halicacabum	Lesser balloon vine		X3	3
Casuarina cunninghamiana	Beefwood	Invader	2 not for use in dune stabilisation	2 within 100m of natural ecosystem
Casuarina equisetifolia	Horsetail tree	Invader	2 not for use in dune stabilisation	2
Catharanthus roseus	Madagascar periwinkle		_	3
Celtis australis	European hackberry, Nettle tree		X3	3
Celtis occidentalis	Common hackberry		X3	3
Eltis sinensis	Chinese nettle tree		X3	_
Cerastium fontanum	Common mouse- ear chickweed		_	1a Prince Edward/Marion
Cereus jamacaru	Queen of the night	Weed	1	1b
Cestrum aurantiacum	Yellow or Orange cestrum	Weed	1	1b
Cestrum elegans	Crimson cestrum	Weed	1	1b
Cestrum laevigatum	Inkberry	Weed	1	1b
Cestrum parqui	Chilean cestrum	Weed	1	1b
Chondrilla juncea	Skeleton weed		_	1a
Chromolaena odorata	Triffid weed, Chromolaena	Weed	1	1b KZN, MP, LP, EC. 1a in rest of SA.
Cichorium intybus	Chicory		_	2
Cinnamomum camphora	Camphor tree	Weed	1 in NP, KZN, MP	1b in KZN, MP, EC, SC.
Cirsium japonicum	Japanese thistle		_	1b
Cirsium vulgare	Spear thistle, Scotch thistle	Weed	1	1b
Coffea arabica	Coffee tree		X2	3
Convolvulus arvensis	Field bindweed, wild morning-glory	Weed	1	1b
Coreopsis lanceolata	Tickseed		X3	3
Cortaderia jubata	Pampas grass	Weed	1	1b in GP. 1a in rest of SA.
Cortaderia selloana (Excluding sterile cultivars)	Pampas grass	Weed	1	1b in WC, EC, KZN, GP 1a in rest of SA
Cotoneaster franchetii	Cotoneaster	Invader	3	1b
Cotoneaster glaucophyllus	Late cotoneaster		_	1b
Coteneaster pannosus	Silver-leaf cotoneaster	Invader	3	1b
Cotoneaster salicifolius	Willow-leaved showberry		_	1b

Cotoneaster simonsii	Simon's cotoneaster		_	1b
Cotoneaster pubescens	Mexican hawthorn		X3	
Crotolaria agatiflora	Canarybird bush, bird flower		X3	1a
Cryptostegia grandiflora	Rubber vine		_	1a
Cryptostegia madagascariensis	Madagascar rubber vine		_	1a
Cuscuta campestris	Common dodder	Weed	1	1b
Cuscuta suaveolens	Lucerne dodder	Weed	1	1b
Cynodon dactylon	Couch grass		X2	_
Cytisus monspessulanus	Montpellier broom	Weed	1	_
Cytisus scoparius	Scotch broom	Weed	1	1a
Datura ferox	Large thorn apple	Weed	1	1b
Datura innoxia	Downy thorn apple	Weed	1	1b
Datura stramonium	Common thorn apple	Weed	1	1b
Diplocyclos palmatus	Lollipop-climber		_	1a
Duchesnea indica	Wild strawberry		_	1b
Duranta erecta	Forget-me-not-tree		X3	3
Echinodorus cordifolius	Creeping burhead		_	1b
Echinodorus tenellus	Amazon sword plant		_	1b
Echinopsis spachiana	Torch cactus	Weed	1	1b
Echium platagineum	Patterson's curse	Weed	1	1b
Echium vulgare	Blue echium	Weed	1	1b
Egeria densa	Dense water weed	Weed	1	1b
Eichhornia crassipes	Water hyacinth	Weed	1	1b
Elodea canadensis	Canadian water weed	Weed	1	1b
Elytrigia repens	Couch grass		_	1a Prince Edward/Marion
Equisetum hyemale	Rough horsetail, Common scouring -rush		_	1a
Eriobotrya japonica	Loquat	Invader	3	3
Eucalyptus camaldulensis and hybrids with E. tereticornus	Red river gum	Invader	2	1b in high fire risk riparian or prot. areas 2 dense coverage areas
Eucalyptus cladocalyx	Sugar gum	Invader	2	1b in riparian or PA's 2 in fire prone veg.
Eucalyptus conferruminata (E lehmannii misapplied in SA)	Spider gum		1 in WC, 2 in rest of SA	1b in riparian or PA's 2 in fire prone veg.
Eucalyptus diversicolor	Karri	Invader	2	1b in high fire risk riparian or prot. areas 2 dense coverage areas
Eucalyptus grandis	Saligna gum, Rose gum	Invader	2	1b in high fire risk riparian or prot. areas 2 dense coverage areas
Eucalyptus paniculata	Grey ironbark	Invader	2	_
Eucalyptus sideroxylon	Black ironbark, Red ironbark	Invader	2	_
Eucalyptus tereticornis	Forest red gum		_	1b in high fire risk riparian or prot. areas 2 dense coverage areas
Eugenia uniflora	Pitanga, Surinam cherry	Weed	1 NP, KZN, MP 3 in rest of SA	1
Euphorbia esula	Leafy spurge		_	1a

Euphorbia leucocephala	White poinsettia		_	1b
Fallopia sachalinensis	Giant knotweed		_	1a
Festuca rubra	Creeping red fescue		_	1a Prince Edward/Marion
Flaveria bindentis	Smelter's-brush		_	1b
Foeniculum vulgare	Fennel		_	2 in WC
Fraxinus americana	American ash		X3	3
Fraxinus angustifolia	Algerian ash		_	3
Galium tricornutum	Three-horned bedstraw, Corn-cleavers		_	1b
Gaura coccinea	Scarlet gaura		_	3
Genista monspessulana	Montpellier broom	Weed	1	1a
Gleditsia triacanthos (excluding sterile cultivars)	Honey locust, Sweet locust	Invader	2	1b
Glyceria maxima	Reed sweet grass		_	2
Grevillea banksii	Australian crimson oak, Red flowering silky oak		_	1b
Grevillea robusta	Australian silky oak	Invader	3	1b
Grevillea rosmarinifolia	Rosemary grevillea		_	3
Hakea drupacea (=H. suaveolens)	Sweet hakea	Weed	1	1a
Hakea gibbosa	Rock hakea	Weed	1	1b
Hakea salicifolia	Willow hakea		X3	_
Hakea sericea	Silky hakea	Weed	1	1b
Harrisia martinii	Moon cactus, Harrisia cactus	Weed	1	1b
Hedera helix subsp canariensis	Canary ivy		X3	3
Hedera helix subsp helix	English ivy		X3	3
Hedychium coccineum	Red ginger lily	Weed	1	1b
Hedychium coronarium	White ginger lily	Weed	1	1b
Hedychium flavescens	Yellow ginger lily	Weed	1	1b
Hedychium gardnerianum	Kahili ginger lily	Weed	1	1b
Homalanthus populifolius	Bleeding-heart tree		_	1b
Houttuynia cordata	Chameleon plant		_	3
Hydrilla verticillata	Hydrilla		_	1a
Hydrocleys nymphoides	Water poppy		_	1a
Hylocereus undatus	Night –blooming cereus		_	1b
Hypericum androsaemum	Tutsan		_	1b
Hypericum perforatum	St John's Wort, Tipton Weed	Invader	2	2
Ipomoea alba	Moonflower	Weed	1 NP, KZN, MP 3 in rest of SA	1b
Ipomea carnea	Morning glory bush		_	1b
Ipomoea indica	Morning glory	Weed	1 NP, KZN, MP 3 in rest of SA	1b
Ipomoea purpurea	Morning glory	Invader	3	1b
Iris pseudacorus	Yellow flag		_	1a
Jacaranda mimosifolia (excluding sterile cultivar 'Alba')	Jacaranda	Invader	3	1b in KZN, MP, LP, NW. 2 in GP 3 in rest of SA.
Jatropha curcas	Physic nut		_	2

Jatropha gossypiifolia	Cotton-leaf physic nut		_	1b
Juniperus virginiana	Red Cedar		X3	3 in FS, EC
Kunzea ericoides	White tea tree / Burgan		_	1a
Lantana sp. All exotic, seed producing species or seed producing hybrids	Lantana, Tickberry, Cherry pie	Weed	1	1b
Lavatera arborea	Tree mallow		_	1b
Lepidium draba	Pepper-cress, Hoary cardaria, White top	Weed	1	1b
Leptospermum laevigatum	Australian myrtle	Weed	1	1b
Leptospermum scoparium	Manuka myrtle		X3	
Leucaena leucocephala	Reuse wattle/Leucaena	Weed	1 in WC, 2 in rest of SA	1a WC. 2 in rest of SA
Ligustrum japonicum	Japanese wax-leaved privet	Invader	3	1b in KZN, MP, LP, EC, WC, GP, NW. 3 in FS, NC.
Ligustrum lucidum	Chinese wax-leaved privet	Invader	3	1b in KZN, MP, LP, EC, WC, GP, NW. 3 in FS, NC.
Ligustrum ovalifolium	Californian privet	Invader	3	1b in KZN, MP, LP, EC, WC, GP, NW. 3 in FS, NC.
Ligustrum sinense	Chinese privet	Invader	3	1b in KZN, MP, LP, EC, WC, GP, NW. 3 in FS, NC.
Ligustrum vulgare	Common privet	Invader	3	1b in KZN, MP, LP, EC, WC, GP, NW. 3 in FS, NC.
Lilium formosanum	St Joseph's ,Trumpet or Formosa lily	Invader	3	1b
Limonium sinulatum	Satice, Sea lavender		_	1b WC, NC.
Linaria dalmatica	Broadleaf toadflax		_	1b
Linana vulgaris	Common toadflax, Butter-and-eggs		_	1b
Litsea glutinosa	Indian laurel	Weed	1	1b
Lolium multiflorim	Italian ryegrass		X2	_
Lolium perenne	Perenial ryegrass		X2	_
Lonicera japonica	Japanese or Hall's honeysuckle		X3	3
Ludwigia peruviana	Water- primrose, Peruvian primrosebush		_	1a
Luzula sp.	Woodrush		_	1a Prince Edward/Marion
Lythrum hyssopifolia	Hyssop loosestrife		_	1b
Lythrum salicaria	Purple loosestrife	Weed	1	1a
Macfadyena unguis-cati	Cat-s claw creeper	Weed	1	1b
Malva dendromorpha	Tree mallow		_	1b
Malva verticillata	Mallow		_	1b
Malvastrum coromandelienum	Prickly malvastrum		_	1b
Melaleuca hypericifolia	Red-flowering tea tree		_	1a
Melia azedarach	Syringa, Persian lilac	Invader	3	1b in KZN, MP, LP, EC, WC, GP. 3 in rest SA.
Metrosideros excelsa	New Zealand Christmas tree	Invader	3	1a in Overstand District.
Mimosa pigra	Giant sensitive plant	Invader	3	1b
Mirabilis jalapa	Four-o'clock, Marve-of-Peru		X3	1b

Montanoa hibiscifolia	Tree daisy	Weed	1	1b
Morus alba (excl cultivar 'Pendula')	Whitemulberry, Common mulberry	Invader	3	2
Morus nigra	Black mulberry		X3	_
Murraya paniculata	Orange Jessamine		_	1b in KZN, MP, LP, EC.
Myoporum insulare	Manatoka, Boobyalla		_	3
Myoporum laetum	New Zealand manatoka		_	3
Myoporum tenuifolium	Manatoka	Invader	3	1b
Myriophyllum aquaticum	Parrot's feather	Weed	1	1b
Myriophyllum spicatum	Spiked water-milfoil	Weed	1	1b
Nassella tenuissima	White tussock	Weed	1	1b
Nassella trichotoma	Nassella tussock	Weed	1	1b
Nasturtium officinale (=Rorippa nasturtium-aquaticum)	Watercress		_	2
Nephrolepis cordifolia	Erect sword fern, Ladder sword fern		_	1b in KZN, MP, LP, EC, WC. 3 in rest SA.
Nephrolepis exaltata	Sword fern	Invader	3	1b in KZN, MP, LP, EC, WC. 3 in rest SA.
Nerium oleander	Oleander	Weed	1	1b
Nicandra physalodes	Apple-of-Peru		_	1b
Nicotiana glauca	Wild tobacco	Weed	1	1b
Nymphaea mexicana	Yellow water lilies		_	1b
Nymphoides peltata (=Limnanthemum peltatum)	Gringed waterlily, Yellow floating -heart		_	1a
Opuntia aurantiaca	Jointed cactus	Weed	1	1b
Opuntia engelmannii	Small round – leaved prickly pear		_	1b
Opuntia exaltata	Long spine cactus	Weed	1	1b
Opuntia ficus-indica Excluding all spineless cactus pear cultivars /selections	Mission prickly pear, Sweet prickly pear	Weed	1	1b
Opuntia fulgida	Rosea cactus	Weed	1	1b
Opuntia humifusa	Large flowered prickly pear, Creeping prickly pear	Weed	1	1b
Opuntia imbricata	Imbricate cactus, Imbricate prickly pear	Weed	1	1b
Opuntia lindheimeri	Small round-leaved prickly pear	Weed	1	_
Opuntia microdasys	Yellow bunny–ears, Teddy–bear cactus		_	1b
Opuntia monacantha	Cochineal prickly pear, Drooping prickly pear	Weed	1	1b
Opuntia robusta	Blue-leaf cactus		_	2
Opuntia spinulifera	Saucepan cactus, Large roundleaved prickly pear	Weed	1	1b
Opuntia stricta	Pest pear of Australia	Weed	1	1b
Orobanche minor	Lesser/ clover broomrape	Weed	1	1b
Orobanche ramosa	Blue broomrape, Branched broomrape		_	1b
Paraserianthes lophantha (=Albizia lophantha)	Australian Albizia, Stink bean	Weed	1	1b

Parkinsonia aculeate	Jerusalem thorn		_	1b
Parthenium hysterophorus	Parthenium	Weed	1	1b
Paspalum quadrifarium	Tussock paspalum		_	1a
Passiflora caerulea	Blue passion flower	Weed	1	1b
Passiflora edulia	Purple granadilla, Passion fruit		_	2 in KZN, MP, LP, EC.
Passiflora tripartite var. mollissima (=P. mollissima)	Banana poka, Bananadilla	Weed	1	1b
Passiflora suberosa	Indigo berry	Weed	1	1b
Passiflora subpeltata	Granadina	Weed	1	1b
Paulownia tomentosa	Empress / Princess tree, Royal Paulownia, Keiserinboom		_	1a
Pennisetum purpureum	Elephant grass, Napier grass			1b
Pennisetum setaceum (Excl sterile cultivar 'Rubrum')	Fountain grass	Weed	1	1b
Pennisetum villosum	Feathertop	Weed	1	1b
Pereskia aculeata	Barbados gooseberry	Weed	1	1b
Persicaria capitata	Knotweed		_	1b
Phytolacca americana	American pokeweed		_	1b
Phytolacca diocia	Belhambra	Invader	3	3
Phytolacca icosandra	Forest inkberry		_	1b
Pinus canariensis	Canary den	Invader	2	3
Pinus elliotti	Slash pine	Invader	2	2
Pinus halepensis	Aleppo pine	Invader	2	2
Pinus patula	Patula pine	Invader	2	2
Pinus pinaster	Cluster pine	Invader	2	2
Pinus pinea	Umbrella/stone pine		_	3
Pinus radiata	Radiata pine, Monterey pine	Invader	2	2
Pinus roxburghii	Chir pine, longifolia pine	Invader	2	2
Pinus taeda	Loblolly pine	Invader	2	2
Pistia stratiotes	Water lettuce	Weed	1	1b
Pittosporum crassifolium	Stiff-leaved cheesewood		_	3
Pittosporum undulatum	Australian cheesewood, Sweet pittosporum	Weed	1	1b
Plectranthus comosus	"Abyssinian" coleus, Wooly plectranthus	Invader	3	1b
Poa pratensis	Kentucky bluegrass		_	1a Prince Edward Island. 1b Marion Island.
Polypodium aureum	Rabbits-foot fern		_	3 in KZN, MP, LP, EC.
Pontederia cordata	Pickerel weed	Invader	3	1b
Populus alba	White poplar	Invader	2	2
Populus x canescens	Grey poplar, Matchwood poplar	Invader	2	2
Prosopis glandulosa & hybrids	Honey mesquite	Invader	2	1b in NW, FS, EC, WC. 2 in NC.
Prosopis velutina & hybrids	Velvet mesquite	Invader	2	1b in NW, FS, EC, WC. 2 in NC.
Prunus serotina	Black cherry		_	1b
Psidium cattleianum	Strawberry guava	Invader	3	1b

Psidium guajava & hybrids	Guava	Invader	2	2 in KZN, MP, LP, EC.
Psidium guineense	Brazilian guava	Invader	3	1b
Psidium x durbanensis	Durban guava	Weed	1	1b
Pueraria lobata	Kudzu vine	Weed	1	1a
Pyracantha angustifolia (excl cultivars under investigation)	Yellow firethorn	Invader	3	1b
Pyracantha coccinea (excl cultivars under investigation)	Red firethorn		_	1b
Pyracantha crenatoserrata (excl cultivars under investigation)	Chinese firethorn, Broad leaf firethorn		_	1b
Pyracantha crenulata (excl cultivars under investigation)	Himalayan firethorn	Invader	3	1b
Pyracantha koidzumii (excl cultivars under investigation)	Formosa firethorn		_	1b
Pyracantha rogersiana (excl cultivars under investigation)	Firethorn		_	1b
Rhus glabra	Scarlet sumach, Vinegar bush		_	3
Rhus succedanea succedaneum	Wax tree	Weed	1	_
Ricinus communis	Castor-oil plant	Invader	2	1b
Rivina humilis	Rivina, Bloodberry	Weed	1	1a
Robinia pseudoacacia	Black locust	Invader	2	1b
Rosa rubiginosa (= R. eglanteria)	Eglantine, Sweetbriar	Invader	1	1b
Rubus cuneifolius	American bramble	Weed	1	1b
Rubus flagellaris	Bramble		_	1b
Rubus fruticosus	European blackberry	Invader	2	2
Rubus niveus	Ceylon raspberry, Mysore raspberry		_	1b
Rumex acetosella	Sheep sorrel, Red sorrel		_	1a Prince Edward/Marion
Rumex usambarensis	East African dock		_	1b
Salix babylonica	Weeping willow	Invader	2	_
Salix fragilis	Crack or brittle willow	Invader	2	_
Salsola kali	Tumbleweed		_	1b
Salsola tragus	Russian Tumbleweed		_	1b
Salvia tiliifolia	Lindenleaf sage		_	1b
Salvinia molesta	Kariba weed	Weed	1	1b
Sambucus canadensis (=S. nigra subsp Canadensis)	Canadian elder		_	1b
Sambucus nigra	European elder		_	1b
Sasa ramose (=Arundinaria vagans)	Dwarf yellow- stripped bamboo		_	3
Scheffiera actinophylla	Australian cabbage tree, Queensland umbrella tree		_	1b in KZN, MP, LP, EC.
Schefflera arboricola	Dwarf umbrella tree		_	3 in KZN, MP, LP, EC.
Schefflera elegantissima	False aralia		_	3 in KZN, MP, LP, EC.
Schinus terebinthifolius	Brazilian pepper tree	Weed	1 in KZN, 3 in rest of SA	1b in KZN, MP, LP, EC. 3 in rest of SA.
Senna bicapsularis (=Cassia bicapsularis)	Rambling cassia	Invader	3	1b

Senna didymobotrya (=Cassia didymobotrya)	Peanut butter cassia	Invader	3	1b in KZN, MP, LP, EC. 3 in rest SA.
Senna hirsuta (=Cassia hirsuta)	_		_	1b
Senna occidentalis (=Cassia occidentalis)	Stinking weed, Wild coffee		_	1b
Senna pendula (=Cassia coluteoides)	_	Invader	3	1b
Senna septemtrionalis (=Cassia floribundasensu laevigata)	Smooth senna		_	1b
Sesbania punicea	Red sesbania	Weed	1	1b
Solanum betaceum	Tree tomato		_	3 in KZN, MP, LP, EC.
Solanum chrysotrichum	Giant devil's fig		_	1b
Solanum elaeagnifolium	Silver-leaf bitter apple	Weed	1	1b
Solanum mauritianum	Bugweed	Weed	1	1b
Solanum pseudocapsicum	Jerusalem cherry		_	1b
Solanum seaforthianum	Potato creeper	Weed	1	1b
Solanum sisymbriifolium	Wild tomato, Dense-thorned bitter apple	Weed	1	1b
Sorghum halepense	Johnson grass, Aleppo grass	Invader	2	2
Spartium junceum	Spanish broom	Weed	1	1b in WC. 3 in rest SA.
Spathodea campanulata	African flame tree		_	3 in KZN, MP, LP, EC.
Sphagneticola trilobata	Singapoer daisy		_	1b in KZN, MP, LP, EC. 3 in rest SA.
Stellaria media	Common chickweed		_	1a Prince Edward Island. 1b Marion Island.
Syzygium cumini	Jambolan	Invader	3	1b in KZN, MP, LP. 1a in rest SA.
Syzygium jambos	Rose apple	Invader	3	3
Tamarix aphylla	Desert tamarisk		_	1b
Tamarix chinensis	Chinese tamarisk	Weed	1 in NC, WC, EC, 3 in rest of SA	1b
Tamarix gallica	French tamarisk		_	1b
Tamarix ramosissima	Pink tamarisk	Weed	1 in NC, WC, EC, 3 in rest of SA	1b
Tecoma stans	Yellow bells	Weed	1	1b
Tephrocactus articulatus	Pine cone cactus, Paper-spine oleander		_	1a
Thelechitonia trilobata	Singapore daisy	Weed	1 in KZN 3 in rest of SA	_
Thevetia peruviana	Yellow oleander	Weed	1	1b
Tipuana tipu	Tipu tree	Invader	3	3
Tithonia diversifolia	Mexican sunflower	Weed	1	1b
Tithonia rotundifolia	Red sunflower	Weed	1	1b
Toona ciliate (=Cedrela toona)	Toon tree	Invader	3	1b
Toxicodendron succedaneum (=Rhus succedaneum)	Wax tree		_	1b
Tradescantia fluminensis	Wandering Jew		_	1b
Tradescantia zebrina	Wandering Jew		_	1b
Triplaris americana	Triplaris, Ant tree	Weed	1	1b
Tropaeolum speciosum	Flame nasturtium/creeper		_	3

Ulex europaeus	European gorse	Weed	1	1b
Verbena bonariensis	Wild/Tall verbena, Purple top.		_	1b
Verbena brasiliensis	Brazilian verbena		_	1b
Vinca major (excl cultivars under investigation)	Greater periwinkle		_	1b
Vinca minor (excl cultivars under investigation)	Lesser periwinkle		_	1b
Vitex trifolia	Indian three-leaf vitex		_	1b
Wigandia urens	Wigandia		_	3
Xanthium spinosum	Spiny cocklebur	Weed	1	1b
Xanthium strumarium	Large cocklebur	Weed	1	1b

APPENDIX 2

USEFUL CONTACTS

Alien Clearing		
Working for Water	http://sites.google.co,/site/wfwplanning/Home http://dwaf.gov.za/wfw weedbuster@dwaf.gov.za	Weedbuster Hotline: 0800 005 376
	Technical Management & Waterweeds Debbie Sharp	dsharp@environment.gov.za 021 441 2741
Cape Nature	http://www.capenature.org.za	
LandCare	http://www.nda.agric.za www.nda.agric.za/docs/landcare	021 976 1759
Herbicide		
Ecoguard	Willie Auret wauret@ecoguard.co.za	082 905 5833 021 862 8457
Training - Responsible use of pesticides: AVCASA	Rahnier Grobler reachoutrg@webmail.co.za	072 624 9498
Bio-control		
Agricultural Research Council for biocontrol	www.arc.agric.za	
Wetland/Ecological Rehabilitation		
Working for Wetlands	http://wetlands.sanbi.org/ WC Provincial Coordinator Heidi Nieuwoudt	h.nieuwoudt@sanbi.org.za
Society for Ecological Restoration	http://www.ser.org	