

**PROPOSED PROSPECTING RIGHT ON PORTION 5 OF  
THE FARM KLOPPERSBOS 128 JR AND PORTIONS 1, 7  
AND 8 OF THE FARM EKUPHUMULENI 716 JR (409.7979  
HA), WHICH FALLS IN MAGISTERIAL DISTRICT OF  
CULLINAN (NOKENG TSA TAEMANE LOCAL  
MUNICIPALITY), CITY OF TSHWANE, GAUTENG  
PROVINCE**

**DRAFT ALIEN INVASIVE MANAGEMENT PLAN**



**SEPTEMBER 2020**

***REFERENCE NUMBER: GP30/5/1/1/2/10650PR***

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## **EXECUTIVE SUMMARY**

Lomeza Opencast Operations (Pty) Ltd (“hereinafter referred to as “the Applicant”), applied for environmental authorisation (EA) and a prospecting right for coal on portion 5 of the farm Kloppersbos 128 JR and portions 1, 7 and 8 of the farm Ekuphumuleni 716 JR (409.7979 ha), which falls in Magisterial District of Cullinan (Nokeng Tsa Taemane Local Municipality), City of Tshwane, Gauteng Province.

All documentation, to date, was based on preliminary data, surrounding information and desktop studies. Access to the study area was denied by the landowners, resulting in limited information being provided to all commenting parties. Numerous attempts and letters requesting access to the properties by the applicant was all in vain. Greenmined is unable to provide the I&AP’s and stakeholders with material information with regards to this prospecting right application and it is therefore clear that the relevant authorities will not be able to provide informed comments, irrespective should it be positive or negative. However, due to the landowners’ refusal to grant access to the properties, the proper studies could not be conducted.

The proposed project triggers listed activities in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and the Environmental Impact Assessment Regulations 2014 (as amended 2017) and therefore requires an environmental impact assessment (basic assessment process) that assess project specific environmental impacts and alternatives, consider public input, and propose mitigation measures, to ultimately culminate in an environmental management programme that informs the competent authority (Department of Mineral Resources and Energy) when considering the environmental authorisation. This report, the Draft Basic Assessment Report, forms part of the departmental requirements, and presents the first report of the EIA process.

The aim of this document is to provide site management with the status of IAPS found on the prospecting footprint and provide long lasting mitigation and management strategies to reduce infestation as much as possible. The overall objective of this report is to ensure substantial growth of indigenous vegetation cover and growth within the prospecting footprint.

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## **LIST OF DEFINITIONS**

Invasive Alien Plant (IAP)	A plant species not indigenous to a location, area, or region, which has either been accidentally or intentionally introduced and whose presence threatens habitats, ecosystems or other species. Their presence may result in economic or environmental harm, or harm to human health.
Alien Species	A species that is not indigenous; or an indigenous species trans located outside its normal distribution range in nature, but that has not spread outside its normal range without human intervention.
Weed	Any plant, indigenous or alien, invasive or otherwise, which is growing where it is not desired.
Emerging weed	Plants with invasive tendencies already present outside of their natural distribution range, but not yet widely so. They often have horticultural value, but can impact negatively on natural ecosystems, biodiversity, livelihoods or human health if allowed to continue to expand to outside of their natural range and become naturalised.
Shrub	A small- to medium-sized woody plant. They have persistent woody stems above the ground. They are distinguished from trees by their multiple stems and shorter height, and are usually under 6 m tall.

## **LIST OF ABBREVIATIONS**

AIMP	Alien Invasive Management Plan
AIP	Alien Invasive Plants
AIP EDRR	Alien Invasive Plants Early Detection and Rapid Response
ARC-PPRI	Agricultural Research Council - Plant Protection Research Institute
ARC	Agricultural Research Council
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
CEBA	Community-based Ecosystem Adaptation Programme (under EPCPD)
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EC	Electrical Conductivity
EMP	Environmental Management Plan
EMPr	Environmental Management Plan report
GIS	Geographic Information System
GPS	Garmin Global Positioning System
IAP	Invasive alien plant
IAPs	Interested and Affected Parties
MPRDA	Mineral Petroleum Resource Development Act
NEMA	National Environmental Management Act
NEM:BA	National Environmental Management: Biodiversity Act
NEMWA	National Environmental Management Waste Act
NWA	National Water Act
PCO	Pest Control Operators
PPE	Personal Protective Equipment
ROM	Run of Mine
SANS	South African National Standards
SANBI	South African National Biodiversity Institute
SLP	Social and Labour Plan
Stats SA	Statistics South Africa
ToR	Terms of Reference

## 1. DECLARATION OF INDEPENDENCE

I, **Sonette Smit**, in my capacity as a specialist consultant, hereby declare that I:-

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of this project, other than remuneration for the work performed in terms of the National Environmental Management Act 107 of 1998;
- Have and will not have vested interest in the proposed activity nor will I engage myself in any conflicting interest associated with this project
- As a registered member of the South African Council for Natural Scientific Professions, I will undertake my profession in accordance with the Code of Conduct of the Council as well as other associates to which I am a member;
- I undertake to disclose and provide to the competent authority any material or information at my disposal regarding this project as required in terms of the National Environmental Management Act 107 of 1998;
- Based on the information provided to me by the client and in addition to information obtained during the course of this study, I have presented the results and conclusion with regard to this project to the best of my professional ability;
- I reserve the right to modify aspects pertaining to this study should additional information become available through ongoing research and further work on this field;
- I undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study.

  
**Sonette Smit**  
**21 August 2020**

## 2. CLIENT REVIEW AND COMMENT

I reviewed and understand the contents of this report. I acknowledge that this Alien Invasive Management Plan is a work in progress.

**NB: The proposed control methods are only recommendations based on information available to the environmental consultant at the time. The environmental consultants employed at Greenmined Environmental are not registered Pest Control Operators (PCO) and in the circumstances the site should ensure that the expert advice and opinion of a registered PCO is sought prior to the commencement and implementation of control methods pertaining to invasive species.**

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Signed

\_\_\_\_\_  
Date

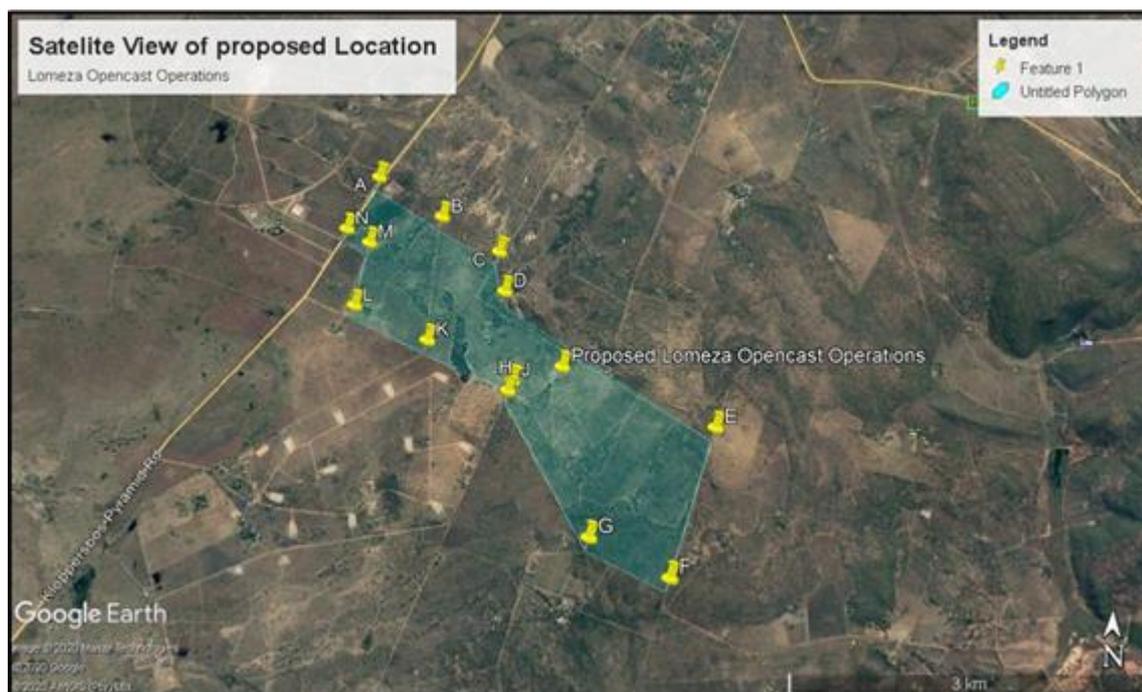


### 3. INTRODUCTION

As mentioned above all documentation, to date, was based on preliminary data, surrounding information and desktop studies. Access to the study area was denied by the landowners, resulting in limited information being provided to all commenting parties. Numerous attempts and letters requesting access to the properties by the applicant was all in vain. Greenmined is unable to provide the I&AP’s and stakeholders with material information with regards to this prospecting right application and it is therefore clear that the relevant authorities will not be able to provide informed comments, irrespective should it be positive or negative. However, due to the landowners’ refusal to grant access to the properties, the proper studies could not be conducted.

According to Mucina and Rutherford (2012) the vegetation type of the surrounding natural areas are known as the SVcb 12 Central Sandy Bushveld which is listed as a vulnerable ecosystem. The vegetation type of the surrounding natural areas consists of low undulating areas, sometimes between mountains, and sandy plains and catenas supporting tall, deciduous *Terminalia sericea* and *Burkea africana* woodland on deep sandy soils (with the former often dominant on the lower slopes of sandy catenas) and low, broad-leaved *Combretum* woodland on shallow rocky or gravelly soils. Species of *Acacia*, *Ziziphus* and *Euclea* are found on flats and lower slopes on eutrophic sands and some less sandy soils. *A. tortilis* may dominate some areas along valleys. Grass-dominated herbaceous layer with relatively low basal cover on dystrophic sands. The study area consists of leve plains with some relief, irregular plains with high hills or ridges can be noted in the area. The vegetation of the area is classified as Savanah Biome, specifically the Central Sandy Bushveld

The aim of this document is to provide site management with the status of IAPS found on the prospecting footprint and provide long lasting mitigation and management strategies to reduce infestation as much as possible. The overall objective of this report is to ensure substantial growth of indigenous vegetation cover and growth within the prospecting footprint.



**Figure 1 Satellite view of the proposed prospecting right area of Lomeza Opencast Operations (image obtained from Google Earth)**

Most of the information was gathered from the Department of Water and Sanitation (DWS), the Agricultural Research Council (ARC) and the Working for Water web-sites. There are around 379 listed alien invasive species, which have been listed as Category 1, 2 or 3 alien invasive species in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) and Category 1a and b, 2 and 3 under the National Environmental Management Biodiversity Act (NEM:BA). This does not include all the exotic species that can be found in South Africa, which would go into the thousands of species, but lists the species which have become problematic within South Africa and require attention and control.

This document focuses mainly on alien invasive species which are listed under legislation and that are typically associated with the Savanna Biomes.

The format includes a summary on the legislation, a brief overview of the problems associated with alien invasive species establishment, various control and eradication methods available, a list of chemicals that are registered and can be utilised against alien invasive species and information sheets for the alien invasive species of concern.

The information sheets indicate the category the alien invasive species belongs to, the growth form of the species, the control measures that can be used against the species, the monitoring methodology that should be applied and, finally, indigenous species that can be utilised for rehabilitation of areas where large infestations occurred. The use of the information sheets allows for easy update of the various information as research uncovers newer, improved control measures against species and as biological control agents become available on the market.

Global trade and transportation have increased the opportunities for plants and other invasive species to cross geographic boundaries like never before. The invasive species problem is expanding rapidly because of the introduction of an increased variety of non-native species and many new types of infestation pathways. Natural controlling processes and limiting factors that kept species in check in their native ecosystems are not present in their new habitats, thereby enabling their populations to thrive. Alien invasive plants species (AIPs) can out-compete native species, especially when ecosystem health is stressed by factors such as drought, fire, pollution, resource over-utilization and landscape disturbances.

Lack of knowledge about how invasive species function in their new environment, significantly inhibits the ability to detect and eradicate new or small infestations. Efforts to find and eliminate new infestations are hampered by the lack of an effective early warning and rapid response systems. In addition, there is a shortage of safe and effective techniques to limit the impact on non-target areas or sensitive natural species. Furthermore, control efforts can be hampered when they extend across multiple political jurisdictions and ownerships especially in urban areas. Rehabilitation and restoration efforts require new and expanded sources of endemic plant materials and improved techniques to repair damaged ecosystems.

#### 4. REFERENCE DOCUMENTS

The following list of documentation was reviewed prior to the audit and was used to formulate the objectives for the AIP management plan:

- I. Alien and Invader Species Regulations, 2014 (as amended 2016) (AIS)
- II. National Environmental Management Act No. 107 of 1998 (as amended) [NEMA];
- III. National Environmental Management: Biodiversity Act No. 10 of 2004 [NEMBA];
- IV. National Water Act No. 36 of 1998 [NWA];
- V. Conservation of Agricultural Resources Act No. 43 of 1983 (as amended) [CARA];
- VI. Fertiliser, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) (as amended);
- VII. The Department of Water Affairs and Forestry Environmental Best Practice Specifications of 2005;  
and
- VIII. Policies on alien invasive eradication methods.

#### 5. OBJECTIVE OF THE AIMP

This document describes the potential sources of AIP infestation and provides a method for their control and management. Furthermore, it aims to provide methods to minimise and also monitor the AIPs infestation as a result of vegetation clearance due to the activity.

The primary objective of this document is to provide a AIPs control and management plan that focuses on AIPs control measures to be implemented by the client on the site.

This objective will be met through the implementation of the management measures specified in this plan, including:

- Effective management of existing alien species;
- Control and rehabilitation of open or unused areas at the site where possible; and
- Minimize re-invasion through preventative measures such as regular monitoring and planting of plant species like grasses in open areas.

#### 6. WHAT ARE ALIEN INVASIVE PLANT SPECIES?

Invasive alien species are those that become established in a new environment, then proliferate and spread in ways that are destructive to biodiversity and / or human interests (Matthew & Brand, 2014). Weeds are usually plants that invade disturbed areas such as stockpile areas, overburden and topsoil stockpiles and firebreaks. Invasive plants are plants that have been imported and has the ability to invade the natural vegetation.

Alien invasive plants and alien invasive infestations have several repercussions, which includes environmental, social and economic. Some of the more obvious issues are:

- They absorb and transpire a large amount of water, which gets wasted and removed for utilisation by other water users. This leads to reduction in water flow if in the vicinity of water bodies and alters aquatic ecosystems.
- In situations where the invasive species are very close to watercourses the plants may alter riverbanks and highly increase the potential of erosion, which could impact on the integrity of the stream or river and alter flood lines. This has negative consequences on associated ecosystems and all downstream water users.
- Large stands of alien invasive species result in loss of land which may potentially be productive resulting in associated negative economic and social impacts.
- Large infestations also reduce the land, which would otherwise be inhabited by indigenous species. This has implications for ecology, where biodiversity is directly impacted and socially, where natural resources that could have been harvested are no longer present.
- Alien invasive species consist of dry material, which causes fire hazards with regard to fire intensities in areas where natural fire incidences are not frequent or intense.

The benefits, therefore, of eradicating and controlling alien invasive species would extend to the social, economic and environmental aspects of South Africa.

Invasive species have been characterized as a “catastrophic wildfire in slow motion”. Thousands of invasive plants have infested hundreds of millions of hectares of land and water across the country causing massive disruptions in ecosystem function, reducing biodiversity and degrading ecosystem health. Forests, mountains, wetlands, rivers health and functioning have been affected by plant invasion which outcompete indigenous or endemic plant species and drain the water resources.

A species is considered invasive if it meets these two criteria:

- It is non-native to the ecosystem under consideration; and
- Its introduction causes or is likely to cause economic or environmental harm or harm to human health.

## 7. LEGAL FRAMEWORK

### 7.1. NATIONAL ACTS

#### 7.1.1. The Constitution of the Republic of South Africa Act (Act No. 108 of 1996) – Section 24

The Constitution is South Africa’s overarching law. It prescribes minimum standards with which existing and new laws must comply. Chapter 2 of the Constitution contains the Bill of Rights in which basic human rights are enshrined. Section 24 of this chapter states that *“Everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”*

Government's commitment to give effect to the environmental rights enshrined in the Constitution is evident from the enactment of various pieces of environmental legislation since 1996, including the National Water Act, the National Environmental Management Act, etc.

### **7.1.2. National Environmental Management Act (Act No. 107 Of 1998) (NEMA), As Amended**

NEMA replaces a number of the provisions of the Environment Conservation Act, 1989 (Act No. 73 of 1989). The Act provides for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions. The principles enshrined in NEMA guide the interpretation, administration and implementation of the Act with regards to the protection and / or management of the environment. These principles serve as a framework within which environmental management must be formulated. Section 2(4) specifies that *“sustainable development requires the consideration of all relevant factors including the following aspects specifically relevant to biodiversity”*:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimized and remedied;
- The development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardized;
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimized and remedied.

The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.

Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

Of particular importance are the Environmental Impact Assessment (EIA) regulations of the Act, which identify activities that may have a substantial detrimental effect on the environment. The identification of these activities results in the activity being prohibited unless the competent authority has granted a written authorization after the consideration of an environmental impact assessment or basic assessment.

### **7.1.3. Conservation of Agricultural Resources Act (Act No. 43 Of 1983) (CARA)**

South Africa has numerous problematic alien invaders, such as black wattle, lantana and queen of the night. CARA sets out to combat invasive plants. The Act categorizes weeds into three categories, with varying degrees of action required for each category of weeds. CARA is currently in the process of being revised. In addition the new regulations on alien and invasive species for the National Environmental Management: Biodiversity Act (NEMBA), Act 10 of 2004 has been published on 1 August 2014.

The Conservation of Agricultural Resources Act, No. 43 of 1983, (CARA) as amended in March 2001, sets out the regulations regarding the control of invasive plants and weeds under Regulations 15 and 16 and provides lists of species declared as invasive plants and indicators of bush encroachment. The Regulations classify the listed alien invasive plants into three categories. The categories can be described as follows:

**Category 1** (CARA) plants are alien invasive species and must be eradicated and controlled. These species have little economic or social value and their invasive habits outcompete indigenous species, severely alter ecosystems and threaten local biodiversity.

Section 15A of CARA states that:

- 1) Category 1 plants may not occur on any land or inland water surface other than in biological control reserves.
- 2) A land user shall control any Category 1 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
- 3) No person shall, except in or for purposes of a biological control reserve –
  - a. establish, plant, maintain, multiply or propagate Category 1 plants;
  - b. import or sell propagating material of Category 1 plants or any Category 1 plants;
  - c. Acquire propagating material of Category 1 plants or any Category 1 plants.
- 4) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with the requirements of sub-regulation (1) on such conditions as the executive officer may determine in each case.

**Category 2** (according to CARA) species have commercial or utility value and may only be grown in demarcated areas, in a controlled manner and under a permit.

Section 15B of CARA states that:

- 1) Category 2 plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.
  - a. The executive officer may on application in writing demarcate an area as an area where Category 2 plants may occur, be established and be maintained.
  - b. An area in respect of which a water use license for stream flow reduction activities has been issued in terms of section 36 of the National Water Act, 1998 (Act No. 36 of 1998) shall be deemed to be a demarcated area.

- 2) The executive officer shall demarcate an area for the occurrence, establishment and maintenance of Category 2 plants only if –
  - a. The Category 2 plants in the area are cultivated under controlled circumstances; and
  - b. The land user concerned has been authorised to use water in terms of the National Water Act, 1998 (Act No. 36 of 1998); and
  - c. The Category 2 plants or products of Category 2 plants in the area are demonstrated to primarily serve a commercial purpose, use as a woodlot, shelter belt, building material, animal fodder, soil stabilisation, medicinal or other beneficial function that the executive officer may approve; and
  - d. All reasonable steps are taken to curtail the spreading of propagating material of the Category 2 plants outside the demarcated areas.
- 3) When an area is demarcated for the occurrence, establishment and maintenance of category 2 plants the executive officer may impose such additional conditions as may reasonably be deemed necessary to keep the Category 2 plants in the area in check.
- 4) No person shall sell propagating material of Category 2 plants or any Category 2 plants to another person unless such other person is a land user of a demarcated area or of a biological control reserve.
- 5) No person shall acquire propagating material of Category 2 plants or any Category 2 plants unless such material or such plants are intended for use in a demarcated area or in a biological control reserve.
- 6) Propagating material of Category 2 plants or Category 2 plants shall only be imported or sold in accordance with the provisions of the Plant Improvement Act, 1976 (Act No. 53 of 1976), the Agricultural Pests Act, 1983 (Act No. 36 of 1983) and the environment conservation regulations.
- 7) A land user shall control any Category 2 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
- 8) Unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.
- 9) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub-regulations (1), (3), (5), (6), (8) and (9) on such conditions as the executive officer may determine in each case.

**Category 3** (CARA) species often have ornamental value and may be grown where they currently exist but cannot be planted, propagated or traded.

Section 15C of CARA states that:

- 1) Category 3 plants shall not occur on any land or inland water surface other than in a biological control reserve.
- 2) Subject to the provisions of sub-regulation (3), the provisions of sub-regulation (1) shall not apply in respect of Category 3 plants already in existence at the time of the commencement of these regulations.
  - a. No land user shall allow Category 3 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.

- b. The executive officer may impose such additional conditions as may reasonably be deemed necessary with regard to Category 3 plants already in existence at the time of the commencement of these regulations.
  - c. A land user must take all reasonable steps to curtail the spreading of propagating material of Category 3 plants.
  - d. The executive officer may, after consultation with the land user, issue a direction in terms of section 7 of the Act that Category 3 plants in existence at the time of the commencement of these regulations must be controlled by means of the measures prescribed in regulation 15F.
- 3) No person shall, except in or for purposes of a biological control reserve –
- a. plant, establish, maintain, multiply or propagate Category 3 plants;
  - b. import or sell propagating material of Category 3 plants or any Category 3 plants;
  - c. acquire propagating material of Category 3 plants or any Category 3 plants.
- 4) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub-regulations (1), (3) and (4) on such conditions as the executive officer may determine in each case.

The National Department of Agriculture is responsible for administering the CARA regulations and landowners having alien invasive species on their property may be penalised. Penalties can be in the form of fines or imprisonment. It is therefore important to have an alien invasive management plan in place that aims at primarily eradicating and secondly controlling alien invasive species. It is also important to keep records of all procedures followed and to have photographic records, as many alien invasive species are difficult to completely eradicate.

#### **7.1.4. National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA)**

NEMBA provides for the management and conservation of biological diversity and components thereof; the use of indigenous biological resources in a sustainable manner; the fair and equitable sharing of benefits rising from bio-prospecting of biological resources; and cooperative governance in biodiversity management and conservation within the framework of NEMA.

The Act also gives effect to international Strategic Review of the Status of Biodiversity Management in the South African Mining Industry agreements relating to biodiversity. The Act states that the Minister of Environmental Affairs and Tourism may identify any process or activity in a listed ecosystem as a threatening process and will, thereafter, be regarded as an activity contemplated in Section 24(2)(b) of NEMA which states that:

- a) Specified activities may not be commenced without prior authorization from the Minister or MEC and specify such activities. This Act allows for any person, organization or organ of state to contribute to biodiversity management. Such a party may submit to the Minister a draft management plan for an ecosystem or species. Should the Minister approve the management plan, an agreement can be entered into regarding the implementation of the plan.
- b) The NEMBA established the South African National Biodiversity Institute (SANBI) and gave it a mandate regarding monitoring, advising and co-coordinating biodiversity issues in South Africa.

The Alien and Invader Species (AIS) regulations was subsequently published in terms of section 97(1) of NEM:BA in August 2014 and amended in July 2016. The AIS regulations, 2014 grouped plants into four categories and prescribes the subsequent management of each category.

- **Category 1a:** Invasive plant species requiring compulsory control. These plants must be removed and destroyed and any species falling within this category is by law required to be eradicated from the environment. No permits should be sought or given to keep or propagate plant species falling within this category. Any form of trade or planting is strictly prohibited.
- **Category 1b:** Invasive plants requiring compulsory control as part of alien invasive plant species control programme. These plants are considered to have high invasive potential, thus require removal and eradication. Plants falling within this category qualify for governmental sponsored alien invasive plants control and management programmes. Furthermore, no permits will be issued to keep or sell plant falling within this category.
- **Category 2:** The plants falling within this category are alien invasive plants regulated by area or locality. These alien invasive plant species requires a demarcation permit in order to import, grow, breed, sell, buy or accept as gifts. However, no permit will be issued for invasive plant species within this category existing in riparian areas or zones.
- **Category 3:** These alien invasive plant species are regulated by activity, thus an individual plant permit is required to import, grow, breed, possess, sell, buy, or move these plants. No permit is issued for Category 3 alien invasive plant species existing in riparian areas.

In order to identifying invasive plants or weeds that need to be controlled / eradicated from site, the plants specified in these groups were used as a guideline.

#### **7.1.5. National Environmental Management Protected Areas Act (Act No. 57 of 2003) (NEMPAA), As Amended**

NEM:PAA provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; for the continued existence, governance and functions of South African National Parks; and for matters in connection therewith.

#### **7.1.6. Mineral and Petroleum Resources Development Act (Act No 28 of 2002) (MPRDA, Section 37(1))**

According to the MPRDA, any prospecting or mining operations must not result in unacceptable pollution, ecological degradation or damage to the environment and must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of projects. Section 37 (1) of the MPRDA acknowledges that the principles set out in Section 2 of the NEMA, apply to all prospecting and mining operations and serve as guidelines for the interpretation, administration and implementation of the environmental requirements of this Act. In addition, mining right holders must give effect to the objectives of integrated environmental management as laid out in Chapter 5 of the NEMA. The MPRDA also obliges the owner of the mining right to rehabilitate disturbed areas and holds the owner responsible for any environmental degradation on his / her site.

#### **7.1.7. National Water Act (Act No. 36 of 1998) (NWA)**

The mining industry is itself dependent on key resource inputs such as water, the provision of which depends on the health and integrity of ecosystems.

The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

#### **7.1.8. National Forests Act (Act No. 84 of 1998) (NFA)**

The Act protects State Forests, Forest Nature Reserves and Wilderness Areas, and the plant and animal life contained therein. In addition the Act allows for management programmes to be established in order to prevent soil erosion and fire, maintain the natural genetic and species diversity and control plants and animals which are harmful to a particular area.

The Act provides for the control and reasonable access to State Forests for the purposes of recreation, education, culture or spiritual fulfilment as well as prohibiting any person from damaging State Forests or contributing to the threat of fire. Forest officers are empowered to arrest any person who has contravened this Act and may seize such person's property. This act also refers to the protected trees that are listed and the licencing permits that is needed to remove, or relocated if needed.

#### **7.1.9. Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947)**

This Act provides for the following:

- Appointment of a Registrar of Fertilizers, Farm Feeds and Agricultural Remedies;
- The registration of fertilizers, farm feeds, agricultural remedies, stock remedies, sterilizing plants and pest control operators;

- Regulate or prohibit the importation, sale, acquisition, disposal or use of fertilizers, farm feeds, agricultural remedies and stock remedies;
- Designation of technical advisers and analysts; and to provide for matters incidental thereto.

In other words, this Act governs the use and application of herbicide:

- All herbicide applications are to be made under the direct supervision of a registered Pest Control Operator.
- All persons applying herbicides are to be trained in their use.
- Correct Personal Protective Equipment (PPE) must be worn.
- Only registered herbicides may be used.
- Correct storage facilities must be used.

## **7.2. PROVINCIAL ACTS, PLANS, POLICY AND ENVIRONMENTAL GUIDELINES**

### **7.2.1. Bioregional plans**

The Bioregional plans aim to provide maps of biodiversity priorities with accompanying land-use planning and decision making guidelines in order to inform decisions associated with land-use planning, environmental assessment, natural resource management and authorization.

### **7.2.2. Biodiversity management plans (BMP)**

BMP's ensure the long term survival in nature of species; to provide the responsible person or organ of state effective monitoring and reporting on species progress and to be consistent with acts, frameworks and applicable bioregional plans or any plans issued in terms of Chapter 3 of the NEMA or any municipal integrated development plans etc.

### **7.2.3. National biodiversity strategy and action plans (NBSAP)**

NBSAP goal is to conserve and managed terrestrial and aquatic biodiversity to ensure a sustainable and equitable benefits.

### **7.2.4. National biodiversity assessment (NBA)**

Formerly known as National Spatial Biodiversity Assessment (NSBA) which is a systematic biodiversity planning approach that aims to give a comprehensive biodiversity assessment (previously it focused on spatial only) throughout the country. Its focus is to mainstream biodiversity priorities throughout the economy and making links between biodiversity and socio-economic development.

### **7.2.5. Mining and biodiversity guideline**

The mining industry plays a vital role in the growth and development of South Africa and its economy. Since the earliest discoveries of minerals in the region, this rich endowment of mineral resources has been a key driver of South Africa's social and economic development. Mining continues to be one of the most significant sectors of the country's' economy, providing jobs, growing our GDP and building relations with international trading partners.

On par with this mineral wealth are exceptional endowments of biodiversity and ecosystems. South Africa is globally renowned as a mega-diverse country that harbours an exceptional number of species in relation to most other countries. This rich biodiversity and ecological infrastructure underpin and support the social and economic development in numerous direct and indirect ways. It is currently impacted upon by mining and other land uses in ways that are not sustainable.

Sustaining the goods and services that flow from ecosystems, and the benefits that these provide over the long term, will require limits in mining and other activities in certain areas. South Africa's Constitution and the laws stemming from it recognise the vital role of both ecological and mineral resources in a development path built upon the socially just, environmentally sustainable and economically efficient use of these resources.

The Guideline offers six principles that should be applied towards good decision making when addressing biodiversity issues and impacts in a mining context:

- 🌿 Apply the law
- 🌿 Use the best available biodiversity information
- 🌿 Engage stakeholders thoroughly
- 🌿 Use best practice environmental impact assessment (EIA) to identify, assess and evaluate impacts on biodiversity
- 🌿 Apply the mitigation hierarchy in planning any mining-related activities and to develop robust environmental management programmes (EMP)
- 🌿 Ensure effective implementation of the EMP, including adaptive management.

## **8. ROLES AND RESPONSIBILITIES**

The Applicant is the responsible proponent and will play a major role in ensuring that this plan is effectively implemented. This plan is environmental legally binding and must be implemented to fulfil the requirements of relevant legislations and recommendation.

## 9. CONTROL OF ALIEN INVASIVE AND PROBLEM PLANT SPECIES

Alien plant invasions cause a decline in species diversity, local extinction of indigenous species and ecological imbalance. Thus, preventing the onset of an alien invasion and management of further spreading is required as they outcompete the indigenous plant species and quickly establish themselves in an area. Therefore, a national strategy has been compiled and identifies four primary categories of programs to address the management of alien invasive plant species and they are as follows:-

- 🌿 **Prevention**—Keep the invasive species out;
- 🌿 **Early detection and rapid response**—Detect and eradicate invasive species to stop them from spreading;
- 🌿 **Control and management**—Eliminate or control the problem of invasive species; and
- 🌿 **Rehabilitation and restoration**—Heal, minimize, or reverse the harmful effects from invasive species.

The occurrence of alien invasive plants not only affect the growth and distribution of natural endemic plants, they also use more water than indigenous plants, some have toxic fruits or leaves which when consumed could be poisonous and lead to fatality. Therefore, alien invasive plant species need to be controlled or removed and the following section contains different methods that could be used to control AIP.

The ultimate aim of an alien invasive species management programme is to eradicate species completely. This is often very difficult as many of the species have seeds that remain viable for a very long time and even after physical removal of plants, the seeds germinate to form new infestations. An alien invasive management programme therefore must be an ongoing practice over many years and should follow the following phases:

- A. The initial bulk eradication of alien invasive species by chemical or mechanical means, and in some instances biological control agents. This may also require rehabilitation if large stands of alien invasive species are removed. Local, indigenous species should be planted in the disturbed areas;
- B. There should also be immediate follow up and all seedlings should be pulled out and removed. This should be done regularly, although the timeframes will vary from species to species depending on their growth forms and rates; and
- C. Finally, areas that appear to be under controlled must continue to be managed and observation of these sites should continue on at least an annual basis. Rehabilitation at sites should also be monitored and action taken immediately if issues occur.

Various control methods are available for control of alien invasive species, including mechanical, chemical and biological control. In most instances, mechanical means are utilised and include physical removal of plants. Research on use of herbicides has been conducted on many species and can be applied in conjunction with mechanical methods. For some species, herbicides have not yet been fully researched and / or herbicides have not been registered and these need to be mechanically controlled. The Department of Water and Sanitation's Working for Water section provides guidelines to the preferred clearing methods for most problem plants. This information can be obtained from their website: <http://www.dwaf.gov.za/wfw/Control/>. The selection of appropriate methods of control shall be based on the species to be controlled, the size of the plants, the density of the stand, the accessibility of terrain and environmental safety.

Biological control of alien invasive species is also an ongoing process and some biological control agents have been released on various alien invasive species and show varying degrees of success. Biological control options need to be carried out with specialist advice from academic or research institutes involved in research of alien invasive species.

Control options utilised must take into account the species being controlled and should take into account the ecosystem in which the control options are being applied. Some of the herbicides registered for control of alien invasive species should not be used in riparian areas, and some should be preferably used over others in areas where natural grass cover occurs. Some herbicides should only be utilised after consultation with a Working for Water technical advisor.

The control options are discussed below as individual actions, but in many cases integrated measures (more than one (1) control measure) are taken for more effective control of alien invasive species. As already mentioned, research with regard to herbicide application and biological control is lacking for certain alien invasive species and these, especially if listed as Category 1 invasive species, need to be managed and mechanical control of these species should be considered as a default control option.

The Department of Water and Sanitation proposes that the following methods of control for age or size target plants:

#### Seedlings

Hand pulling or hoeing:

- ✦ Hand pulling / hoeing should be carried out in sparse stands.
- ✦ Seedlings should be severed below the soil surface or removed from the soil. Soil disturbance should be minimized to reduce re-germination.

Herbicides:

- ✦ Herbicides can be used on dense stands.

#### Saplings

Hand pulling or hoeing:

- ✦ Where appropriate saplings can be removed manually as described above.

Herbicides:

- ✦ Foliar sprays can be carried out depending on the density of the stand. Fan nozzles should be fitted for overall spraying and solid cone nozzles for individual plant treatment. Spraying should be restricted to plants waist high or lower. Ensure there is sufficient foliage to carry the herbicide to the root system.
- ✦ Basal stem treatments of suitable herbicides in diesel can be carried out to the bottom 250 mm of the stem. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle.
- ✦ Cut stump treatments can be used where stems are cut as low as practical. Herbicides are applied in diesel or water as recommended for the herbicide. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

#### Mature Trees (trees above shoulder height or robust bushes 12 – 1 months or older)

##### Ring Barking:

- ✦ Bark must be removed from the bottom of the stem to a height of 0.75 – 1.0 m. All bark must be removed to below ground level for good results.
- ✦ Where clean de-barking is not possible due to crevices in the stem or where exposed roots are present, a combination of bark removal and basal stem treatment should be carried out.

##### Frilling or partial frilling:

- ✦ Cuts should be made through the bark into the sapwood by means of a light axe and a suitable herbicide must be applied into the cuts.

##### Basal stem treatments:

- ✦ Suitable herbicides should be applied in diesel to the base of the stem and to any exposed roots. Stems with a diameter up to 50 mm should be treated to a height of 250 mm and stems above 50 mm diameter to a height of 500 mm. This method is only suitable for stems up to 100 mm in diameter.

##### Cut stump treatment:

- ✦ Stumps should be cut as low as practical and the herbicide applied. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

When herbicides are chosen as the preferred control method the guidelines of Working for Water (DWS) as stipulated in the Policy on the Use of Herbicides for the Control of Alien Vegetation should be followed:

- ✦ Herbicides selected for control shall be registered for use on that species under the conditions specified.
- ✦ Protection of the environment is of prime importance. Riparian areas must be protected and only herbicides that are approved may be used. Washing of equipment or disposal of waste spray mixture is prohibited in or near water courses where contamination of water can occur.
- ✦ Empty herbicide containers must be disposed of as hazardous waste and may not be used for any other purpose.
- ✦ Equipment must be washed where there is no danger of contamination of a water source or natural vegetated area. It is proposed that washing be restricted to the wash bay.
- ✦ Product and spray mixtures should be stored so that it is inaccessible to the public. Site management must ensure that the Safety Data Sheet of the product is available on site.

## CHEMICAL CONTROL

Chemical control requires the application of herbicides which can either be highly selective, or non-selective (inhibit certain plants or toxic to all plants respectively), or can be localised or systemic (act on the area where it is applied or attack areas of growth respectively). In most cases, herbicides utilised against alien invasive species are systemic.

Selective herbicides have been registered against specific alien invasive species and the plant names are shown on the labels. Many alien invasive species, however, do not have registered herbicides, and in such cases general herbicides such as Garlon 4 (used with wetter Actipron when applied as spray), Roundup, Mamba, Clearout, or Tumbleweed (the latter 4 on less woody species) can be tested but success is not guaranteed. When the test show positive results, it is suggested that the results be communicated to various research institutes (reference <http://www.wessa.org.za>).

Chemical control is at times the only viable option for the control of invasive species, and more often than not is more cost effective and less time-consuming than mechanical control options. If used incorrectly, chemical control can be damaging to the receiving environment and affect indigenous species negatively. Specialised equipment and training and / or supervision and, in some cases, technical advice are required.

### 9.1.1. Control methods, equipment and safety precautions

When applying herbicides, always follow dosage recommendations and application procedures described on the labels. Increasing dosages may have negative impacts on the receiving environment and may reduce the efficacy of the herbicide.

When applying herbicides, it is important to consider the following:

- Chemical control of alien plants is not recommended in aquatic systems due to the risk of pollution, but may be used on the floodplain in conjunction with cutting or slashing of plants;
- Chemicals should only be applied by qualified personnel;
- Only approved chemicals should be applied;
- Follow the manufacturer's instructions carefully;
- Appropriate protective clothing must be worn;
- Chemicals to be applied immediately after cutting;
- Only designated spray bottles to be used for applying chemicals; and
- Decanting of chemicals and cleaning of equipment should be undertaken at a designated location using drip trays and ground sheets to prevent spillage and contamination of the soil.

#### Do:

- Spray when plants are actively growing;
- Ensure that herbicide is mixed according to label application rates (info on herbicides to use can be requested from Department of Agriculture, Forestry and Fisheries or National Department of Agriculture or relevant entities);
- Ensure correct application of safety gear at all times;
- Plan the application of herbicides before the operation commences;
- Spray when the sun is shining;

- Use a drip sheet and keep herbicide in a demarcated area in the veld, out of direct sunlight;
- Apply spray to the canopy and stems;
- Include dye to assist in the identification of areas that have been cleared; and
- For certain species mainly, for foliar application, a wetting agent should be added to the herbicide mix to allow for better absorption.

**Do not:**

- Spray during strong wind, or where there is the slightest evidence of drift;
- Spray when it is very hot;
- Spray when plants are stressed or dormant;
- Spray plants that are over 1 m;
- Apply herbicide in the rain or on wet, damp leaves; and
- Spray near children, animals or water bodies.

In addition, it is always best to control invasive alien plants when the plants are young, rather than when it is woody and difficult to remove by hand. Furthermore, it is sometimes difficult to distinguish between young invasive species and natural species, so care should be taken at all times. Consider engaging an experienced alien clearing team (Department of Water Affairs - Working for Water unit could offer assistance and expertise on how best to remove and manage alien plants on the property).

**1.1.1.1. Foliar Application**

This method requires the herbicide to be sprayed onto leaves and young stems. The herbicide is sprayed in quantities on these plant parts to the extent just prior to running off the leaves and stems. In some instances, other agents are applied to increase the adhesiveness of the herbicide or to increase the liquidity of the herbicide. Sufficient foliage must be present for the herbicides to be effective and in cases of re-growth, minimum heights of 0.5 m need to be reached prior to application. Equipment will require adequate spray packs, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks. Do not spray just before rain (a rainfall-free period of 6 hours is recommended) or before dew falls. Avoid spraying in windy weather as the spray may come into contact with non-target plants. Spraying dormant or drought stressed plants is not effective as they do not absorb enough of the herbicide.

**1.1.1.2. Basal Stem**

This method is used for smaller woody species with thin stems (< 20 cm) and bark. The herbicides are mixed with diesel at dosages recommended on labels and applied to the stems from ground level to at least 0.3 m with a paint brush. Spraying can be used as an alternative. This method should also be applied to bark remnants left on the stem during strip-barking. Equipment will require adequate spray packs or paintbrushes, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks.

**1.1.1.3. Frilling**

This method is described in the mechanical control measures and repeated here as it is always accompanied by the application of herbicides. Herbicides are mixed with water at the recommended dosage and applied with a hand-held syringe or sprayer. Equipment will require adequate spray packs or syringes, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks.

#### **1.1.1.4. Stem Injection**

This method is limited for use on cacti. Four (4) holes (for a 2 m plant) are made near the base of the stem and around 2 ml of water-soluble herbicide solution, mixed at recommended dosage is poured in each hole. Equipment will require adequate syringes, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks.

#### **1.1.1.5. Stump Application**

This entails the application of herbicides to the cut stumps of felled trees. The stump should be short, level and smooth with all bark in place. Stems should be cut as low as practical and stipulated on the label. The herbicide should be mixed to the correct dosage and applied no later than twelve (12) hours after the felling. For cut stump applications, the herbicide should be closely sprayed onto the outer rings of the stump and the entire stump for stems < 50 mm wide. In specific instances herbicide will need to be applied to the cut surface, the sides and any exposed roots. Equipment will require adequate spray packs, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks. Herbicides are applied in diesel or water as recommended for the herbicide. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

#### **1.1.1.6. Stalk Immersion**

There are currently no alien invasive species which have herbicides registered against them for this particular method. It may be successful on climbers and should be tried if mechanical control options are unsuccessful or difficult. The method includes the cutting of main stems at <1 m height, the digging up of roots or treatment of roots with herbicide and the placement of an inverted plastic bottle containing herbicide over the stem. The bottle should be secured in place and checked regularly to see if herbicide is still present. The generic herbicides mentioned above can be tested for this method. A hazardous sign or tape should be placed around the bottle. Equipment will require adequate plastic bottles, proper measuring equipment to mix correct doses and safety gear, which will include at least rubber gloves, safety glasses and masks.

### **9.1.2. Soil application**

This requires the application of herbicides to soils and should only be utilised by technical specialists.

### **9.1.3. Registered herbicides that can be utilised**

Various herbicides are mentioned in Table 1 below. Many alien invasive species do not have specific registered herbicides which have been properly researched and tested. In these instances only mechanical measures have been discussed but the general herbicides listed in Table 1 can be tried against these species, although success may not be guaranteed.

**Table 1: List of herbicides, which can be used for control of alien invasive species and problem plants**

TRADE NAME	ACTIVE INGREDIENT	ACTIVE INGREDIENT	GENERAL COMMENTS
Mamba 360 SL	Glyphosphate isopropylammonium salt	360 g/l	Can be used as a general herbicide.
Touchdown Forte	Glyphosphate trimesium	480 g/l	
Viroaxe	Triclopyr butoxyethyl ester	480 g/l	Do not apply in riparian areas. Use preferentially in grassy areas.
Garlon 480 EC	Triclopyr butoxyethyl ester	480 g/l	Can be used as a general herbicide. Use preferentially in grassy areas. Use Actipron for wetter spray applications.
Timbrel 360 SL	Triclopyr triethylammonium salt	360 g/l	Do not apply in riparian areas. Consult working for water technical advisor.
Stumpout	Mycoherbicide		
Chopper SL	Imazapyr	100 g/l	Do not apply in riparian areas
Access 240 SL	Picloram potassium salt	240g/l	Needs to be used in selected areas only. Consult working for water technical advisor.
Roundup	Glyphosphate isopropylammonium salt	450 g/l	Can be used as a general herbicide.
Clearout	Glyphosphate isopropylammonium salt	360 g/l	Can be used as a general herbicide.
Tumbleweed	Glyphosphate isopropylammonium salt	240 g/l	Can be used as a general herbicide.
Taskforce	Flupropanate, present as sodium salt	745g/l	
Starane 200	Fluroxypyr	200 g/l	

***N.B. A PCO should always be consulted before applying herbicides to the environment. Always wear the appropriate safety clothing when working with herbicides. Mix all herbicides on a drip groundsheet when working in the veld. Keep away from watercourses. Do not rinse herbicide equipment in the veld. Always read the herbicide label and observe instructions for safe use of herbicide.***

#### **9.1.4. Mycoherbicides**

A mycoherbicide is applied as an herbicide but is not a chemical agent. It is instead a mixture of fungal spores which tend to be host-specific and on application these spores penetrate the plant where the fungus germinates. The pathogen may result in the killing of the undesirable plant. One (1) mycoherbicide, Stumpout, has been registered for application to various wattle species stumps

## MECHANICAL CONTROL

Mechanical control means the physical removal of plants from the problem area. It is often accompanied by chemical control although these are further discussed below. Some common mechanical control methods include uprooting, hand pulling, felling, slashing, mowing, ring barking, bark stripping and frilling. It is an effective method if applied frequently, but is labour intensive during times when infestation levels are high, and requires constant follow-up. An advantage is that mechanical control requires minimal technical knowledge, little training and / or supervision. Also, with effective rehabilitation of areas concerned, the disturbance to the environment is minimal, as no other active agents were introduced to the environment.

### 9.1.5. Control Methods, Equipment and Safety Precautions

When applying mechanical control methods, it is important to consider the following:

- Always start at the highest point and work downwards i.e. downhill or downstream;
- Start from the edge of the infestation and work towards the centre;
- Take care to prevent the spread of cuttings, which could take root further downstream;
- Ensure all root material is removed;
- Once plants have been removed, banks and slopes should be stabilised by erosion protection measures (such as geotextiles or other suitable material); and
- When stacking material, take note of fire protection measures and remember to always stack the material in rows.

#### 1.1.1.7. Uprooting and Hand Pulling

Hand pulling is most effective where plants are small (30 cm), immature or shallow rooted. This entails the physical removal of plants by grabbing them at their base and pulling them out of the ground with their roots. In some situations, the root systems will need to be dug out, and hoes, spades and pick-axes may be required. This process should preferably be conducted when plants are not seeding. If this is not possible, the seed heads should be carefully removed and disposed of prior to the control method being applied. Thick leather gloves and safety glasses should be worn during this process.

#### 1.1.1.8. Felling

In situations where trees are on a slope or in a precarious situation, the species must be controlled *in situ* and not felled. This control option entails the physical removal of woody plants using chainsaws, axes or machetes. Preferably de-branch cut trees. Generally, the plants are cut as low to the ground as possible, but this does vary with some species. Again, gloves and safety glasses should be used during this process and training may be required with felling of large trees as safety precautions has to be adhered to. Herbicides must immediately be applied (no later than 30 min) to the cambium layer; and all the cuts in the cambium layer must be treated. This control measure may be accompanied with chemical control measures where applicable.

#### 1.1.1.9. Slashing and mowing

This method is most effective for plants in the immature stage, or for plants that have relatively woody stems / trunks. This is an effective method for non-resprouters or in the case of resprouters (coppicing), if done in conjunction with chemical treatment of the cut stumps. This is the physical removal of herbaceous plants from the base using machetes or lawn mowers. This process should preferably be conducted when plants are not seeding. If this is not possible, the seed heads should be carefully removed and disposed of prior to control method being applied. Gloves and safety glasses should be worn during this process. Use tools such as pangas (slashers), handsaws, bow-saws, chainsaws, brush cutters and axes.

#### **1.1.1.10. Ring barking and bark stripping**

This entails the removal of bark from the base of the stem (from below the soil layer) to a height of about 1 m. In some instances, the cambium (include the cork layer) is also removed in a 30 cm wide band around the stem at a height of around 50 cm. Bush knives or hatchets should be used for debarking and safety gear should include at least gloves and safety glasses. This control measure may be accompanied with chemical control measures where applicable.

Application of suitable herbicide in diesel can be carried out to the bottom 250 mm of the stem. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush. If multi stemmed, then each stem needs to be treated. Remove the bark and cambium around the trunk of the tree for a continuous band around the tree at least 25 cm wide, starting as low as possible. Where clean de-barking is not possible due to crevices in the stem or where exposed roots are present, a combination of bark removal and basal stem treatments should be carried out; and for better control of aggressively coppicing species pull off the bark below the cut to ground level (bark stripping), to avoid the use of herbicides.

**Note: Since this method means that the tree is left standing, it is only recommended for single trees, not for stands.**

Slashers or axes should be used for debarking. Where bark stripping is used, then all the bark shall be stripped from the trunk between the ground level and 1 meter above ground level; and application of suitable herbicide can also be used with this method. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.

#### **1.1.1.11. Frilling**

This method uses an axe or bush knife which cut into the bark and cambium layer at angles in a ring around the tree. The cuts are made around 0.5 m above ground.

The cuts should be right through the cambium layer and form a solid ring of cuts around the trunk of the tree. Immediately apply the registered herbicide to the cuts by spraying into the 'frill'. The 'frill' needs to be deep enough to retain the herbicide.

This method is always accompanied by chemical control measures. Safety glasses and gloves should be worn.

#### **1.1.1.12. Grubbing / hoeing / digging out / tree poppers**

Grubbing, hoeing, or digging involves the use of a hoe, stick, tree popper or spade. The entire plant and root must be removed. Use the following method:

- Dig around the plant making sure the sand is loosened around the root system;
- Dig down, under the roots, applying pressure, and wrench the entire plant out;
- Kicking the plant may help to dislodge it, however, care should be taken if the plant is seeding, as dry seeds may be dislodged; and
- Stockpile removed material into piles of 2 m high, 3 m wide windrows / stacks.

## **BIOLOGICAL CONTROL**

Biological control is an attempt to introduce the plant's natural enemies (such as pathogens, invertebrates and vertebrates) to its new habitat, with the assumption that these natural enemies will remove the plant's competitive advantage until its vigour is reduced to a level comparable to that of the natural vegetation.

This method is considered because:

- It is environmentally responsible as it does not cause pollution and affects only the target plant;
- It is cost-effective;
- It does not disturb the soil or create large empty areas where other invaders could establish, as it does not kill all the target plants at once; and
- It allows the natural vegetation to recover gradually in the shelter of the dying weeds.

Natural enemies that are used for biological control are called bio-control agents. In the control of invasive plants, the bio-control agents used most frequently insects, mites and pathogens (disease-causing organisms such as fungi). Bio-control agents target specific plant organs, such as the vegetative parts of the plant (its leaves, stems or roots) or the reproductive parts (flowers, fruits or seeds). The choice of bio-control agents depends on the aim of the control project. If the aim is to eradicate the invasive plant species, scientists select the types of bio-control agents available which will cause the most damage. In such projects, scientists may use agents that affect the vegetative parts of the plant as well as agents that reduce seed production. However, if the target plant is useful in certain situations but becomes a pest when uncontrolled, conflict of interests arises regarding biological control. This conflict is usually resolved by avoiding bio-control agents that have the ability of causing damage to the useful part of the plant, and instead using only seed-reducing agents.

These reduce the reproductive potential of the plants, curb their dispersal and reduce the follow-up work needed after clearing, while still allowing for the continued utilisation of the plant. For instance, trees are normally grown for their wood, but the seeds are seldom utilised. If seeds are needed to replant a plantation, a seed orchard can be specially protected against the bio-control agents in the same way as other crops are protected against insect pests.

If, on the other hand, the pods are the most valuable part of the tree, as in the case of mesquite (*Prosopis* spp.), bio-control agents can be selected that will prevent pod production. The seed-feeding beetles that were introduced against mesquite prevent only the germination of seeds from animal droppings, without significantly reducing the nutritional value of the pods, and in other words do not prevent pod or seed production. Bio-control agents are mostly introduced from the country of origin of the plant. The bio-control method is considered to be the safe and environmentally friendly control method due to the methodology and care taken into implementing it.

### **6.3.1. Implementing Biological Control**

Before the official release of a bio-control agent in South Africa, extensive studies are carried out in a quarantine facility to ensure the agent will not damage other, non-target plants.

A bio-control agent is only released once it has been proved as sufficiently host-specific for release in this country. Tested and approved bio-control agents therefore do not pose a threat to our own crops or indigenous vegetation, or to those of neighbouring countries. No cases have occurred of weed bio-control agents changing their host plant affinities after their release in a new country to include plants other than those known to be acceptable hosts.

### **6.3.2. Effectiveness of Biological Control Method**

Probably without exception, bio-control agents do not completely exterminate populations of their host plants. At best, they can be expected to reduce the weed density to an acceptable level or to reduce the vigour and / or reproductive potential of individual plants. The fact that a few host plants always survive, in spite of the attack by a bio-control agent, actually ensures that the agent does not die out as a result of a lack of food. The small population of bio-control agents that persists will disperse onto any re-growth or newly-emerged seedlings of the weed. For this reason, bio-control can be regarded as a sustainable control method. Biological control works relatively slowly. On average, at least five years should be allowed for a bio-control agent to establish successfully before causing significant damage to its host plant. Unfortunately, not all growth of invasive plant species can be curbed purely by biological control. It could happen that effective bio-control agents do exist, but cannot be released in South Africa because they are not sufficiently host-specific.

Alternatively, the invasive plant might be a man-made hybrid between two or more species, and is no longer an acceptable host to the natural enemies of either of the parent plants. It could also happen that the natural enemies of some plants are not adapted to all the climatic regions in which the plant is a problem in South Africa, or that the habitat already contains predators or parasitoids that attack the bio-control agents. In such cases, biological control will have to be replaced or supplemented by chemical or other control measures.

### **6.3.3. Integrating Biological Control into Weed Management**

In some instances, bio-control agents may effectively control a weed on their own. In other cases, the bio-control agents should be incorporated into a more comprehensive weed control programme that might include other methods of control such as chemical and mechanical control as well as utilisation of products of the weed. To make optimal use of the available bio-control agents, the following points should be considered:

- The possible use of bio-control agents should be kept in mind during the planning phase of any weed control program; and
- The person in charge of planning must find out which agents are available, what they do and how to use them. One then has to consider how best to integrate the use of the bio-control agents with the other control methods.

#### **6.3.4. Biological Control Agent Reserves or Refugia**

The mechanical or chemical clearing of large weed infestations may eliminate any bio-control agents present on the weed in that area. It is therefore essential to establish small reserves of healthy, mature plants on which the agents can survive and reproduce and from which they can spread onto plants that may have escaped the clearing process.

Some agents disperse rapidly on their own and can readily colonise extensive areas, while others; such as *cochineal* insects and mealy bugs have to be collected manually from the reserves and released in the target areas. Therefore, a person involved in cactus bio-control should always remove some insect-infested cactus plant material and distribute it to healthy cactus before the *cochineal* or mealy bugs have destroyed their host plants in a specific area. This ensures that the bio-control agents do not become extinct locally, but maintain their presence in the area to colonise re-growth.

### **6.4. HANDLING AND DISPOSAL OF PLANT DEBRIS OR MATERIAL**

The unwanted plant material from mechanical or chemical clearing should not be kept on site as it attributes to the fire risk by providing fuel. Therefore, the following handling and disposal method could be utilized as some of the debris can offer services and some can be completely disposed of:

#### **6.4.1. Stacking**

- Stacking the cut material in heaps, or in windrows along slope contours to reduce erosion, facilitates easy access for follow-up. It also assists in containing the resulting fuel load and therefore the risk of uncontrolled fire;
- Keep stacks well apart to prevent fires from crossing easily; not less than five meters apart, this is naturally dependant on the size of the stack and the resulting fire intensity when they burn. Stockpile removed material into piles of 2 m high, 3 m wide windrows / stacks;
- Stack light branches separately from heavy timber (75 mm and more). Preferably remove heavy branches to reduce long burning fuel loads that can result in soil damage from intensely hot fire; and
- Do not make stacks under trees, power and telephone lines, within 30 meters of a fire belt or near watercourses, houses and other infrastructure.

### 6.4.2. Disposal

- Plant material should be used beneficially wherever possible, as opposed to disposing it at a landfill site where it takes up valuable airspace;
- Woody and dry material, provided no seeds are present, can be chipped and used as mulch or made available to the local community for firewood;
- Wet material and aquatic weeds should be combined with other organic matter and composted. Alternatively, it may be possible to use it for basket making, animal feed or other uses.
- Material which cannot be used beneficially must be disposed of at a registered and approved disposal site.
- When removing material, take care to remove all debris, including shoots and seeds.

## 6.5. CONTROL PHASES

Alien invasive plant species removal should ideally adopt a hands on approach. The combination of two or all three control methods could prove more effective than using one control method in combating the problematic plant species. Therefore, it is advisable that landowners should:

- ▣ Not allow conditions to develop on their land that will contribute to the spread of a wildfire;
- ▣ Remove invasive alien plants that create large fuel loads or cause fires to burn intensely; and
- ▣ Take steps to fireproof their property and possessions. These apply especially to those living on the edge of open areas or in close proximity to fire prone areas.

Furthermore, any control programme for alien vegetation must include the following three phases;

1. **Initial control:** drastic reduction of existing population;
2. **Follow-up control:** control of seedlings, root suckers and coppice growth; and
3. **Maintenance control:** sustain low alien plant numbers with annual control.

The initial control in most cases, involves mechanical methods and in the case of heavy infestation, machinery could be used. The initial control is a drastic measure to reduce the number of adult and large invasive plants.

The follow-up control serves are measures to reduce the ability of the mechanically removed plant species for coppice or having the infestation proliferate such as to negate the efforts of initial control. Therefore, follow up control of alien seedlings and coppice re-growth is essential to achieve and sustain the progress made with initial control work.

Maintenance control entails regular monitoring to prevent the occurrence of re-colonisation or re-infestation. The monitoring should take place timeously so to prevent infestation of the cleared area by another alien invasive plant species.

## 7. ALIEN INVASIVE PLANT ERADICATION TOOL

Working for Water provides the site manager with an implementation tool to control problem species and keep the site free of invasive plants:

### Step 1: Conduct Site Assessment;

- ✎ Identify areas where alien invasive species need to be eradicated and controlled. Take pictures of these sites so as to have a pre-control photographic reference of the site. In this way comparisons can be made at later stages to see if control measures are adequate.

### Step 2: Set objectives based on resources available and priorities:

- ✎ Prioritize management of plants according to the categories stipulated in the AIS regulations.
- ✎ Consider control options that will be applied in these areas. Consider integrated approaches and ensure approaches are not conflicting with each other. Also consider safety aspects such as trees on a slope which should not be felled but treated *in situ*.

### Step 3: Develop and implement an action plan to achieve objectives:

- ✎ The plan must be long term and should include a clearing plan that includes follow up actions for rehabilitation of the cleared area.
- ✎ The site plan should include a map showing the areas invested with problem plants.
- ✎ Lighter invested areas should be cleared first to prevent the build-up of seed banks, while the control plan works progressively towards the areas with denser stands.
- ✎ Educate workers on the species that needs to be eradicated, as well as the specific method to be used.
- ✎ Conduct control of invasive plant species.
- ✎ Remove plant remains to a suitable disposal area.
- ✎ Prevent dispersal of seeds.
- ✎ Strive for collective management and planning with neighbours to prevent seed dispersal of problem plants across boundaries.
- ✎ When removing alien invasive species from infested areas, always work from lower infested areas towards more infested areas and from higher-lying areas to lower areas;
- ✎ Try to remove alien invasive species when they are not seeding. If seeding, then seed heads should first be carefully removed and disposed of in a sealed bag so as not to spread the seeds;
- ✎ If soils are disturbed during the process, then these should be carefully levelled, slightly pressed down and covered with leaf litter or cut vegetation that is seed-free. Some alien invasive species release chemicals that suppress growth of other plants and these should not be utilised as leaf litter under any circumstances. The soil can also be re-seeded with indigenous vegetation;
- ✎ To reduce the risk of spread via seeds, flowers should be removed from the plants prior to seeding. To prevent further infestations, remove seeds, fruits, bulbs, corms, tubers and any other vegetative parts that may root from the site in sealed bags and dispose of safely. In some instances, these parts should be burnt on site immediately;

- Consider herbicide practices to integrate with physical removal where possible, with use of generic herbicides on alien invasive species without registered herbicides;
- Consider the uses of plants that will be removed. Options such as its potential for compost heaps (as long as it is seed free), potential as leaf litter (as long as it is seed free) and possible options for timber and cork markets. As stated earlier, some alien invasive species release chemicals that suppress growth of other plants and these should not be utilised as leaf litter under any circumstances.

Step 4: Monitor performance and change actions if necessary

- Conduct monthly inspections to enable early detection of grow back.
- Regularly follow up on areas where infestations were treated and re-apply control measures if necessary. Once again, take photographs of sites regularly and keep records of actions that were taken so that evidence is in place with regard to control measures that were successful and those that were not.
- Consider rehabilitation of area cleared of invasive species at every stage of the control programme and consider the need to re-introduce local indigenous species to help the natural ecology stabilise within the areas.
- Consider training of employees. Courses range from introductory and awareness courses to those that qualify individuals as alien invasive control officers.

**Table 2: Alien invader plants control plan to be implemented by site management**

ALIEN INVASIVE PLANTS CONTROL PLAN		
Method / Procedures	Equipment	Responsibility
<b>1. PLANT IDENTIFICATION AND LISTING</b>		
<ul style="list-style-type: none"> <li>The site must be visually inspected for alien plant species and the observed AIP's must be listed.</li> <li>All observed and identified plant species should be categorised according to the list contained Appendix 1 and be removed according to the methods stipulated under heading 2 and 3 of this table.</li> </ul>	<ul style="list-style-type: none"> <li>Camera</li> <li>Global Positioning System (GPS)</li> <li>AIPs and problem plants identification guides such as Bromilow's <i>Problem Plants of South Africa: A guide to the identification and control of invasive plants</i> as well as Henderson's <i>Alien Weeds and invasive plants – Complete guide to declared weeds and invaders in South Africa</i>.</li> </ul>	<p><b>Stage 1:</b> Identification and listing should be done by site management utilizing the suggested field guides.</p> <ul style="list-style-type: none"> <li>Time frame – for the duration of the operational and decommissioning phases.</li> <li>AIPs are opportunistic species that will use the gap created by project disturbance to spread and establish themselves. Therefore, a monthly monitoring regime, to assess alien invasion, should be maintained</li> </ul>
<b>2. CONTROL OF AIPS</b>		
<ul style="list-style-type: none"> <li>Site management shall appoint a suitably qualified specialist and/or contractor who will be able to distinguish between the invasive and indigenous plant and clear the alien invasion.</li> <li>Four methods can be applied for alien infestation clearing as stipulated by DWS: <ul style="list-style-type: none"> <li>Mechanical control;</li> <li>Chemical control;</li> <li>Biological control;</li> <li>Integrated control.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>It is advised that an experienced alien invasive removal contractor be appointed as there is a need to: <ul style="list-style-type: none"> <li>Train personnel on how to handle machinery used in mechanical control;</li> <li>Train personnel to handle, mix and apply the herbicides used for chemical control; and</li> <li>Provide guidance on which insects or pathogens to use if management opts for biological control.</li> </ul> </li> </ul>	<p><b>Stage 2:</b> Site management is advised to liaise with the South African National Biodiversity Institute (SANBI) Alien Invasive Plants Early Detection and Rapid Response (AIP EDRR) Unit (contact: 021 799 8837 or <a href="mailto:alienplants@sanbi.org.za">alienplants@sanbi.org.za</a>) on the management of AIPs found on the property.</p> <ul style="list-style-type: none"> <li>Time frame: Operational-, and decommissioning phases as well as the 12 month after care period of the prospecting activities.</li> <li>Furthermore, liaison could be established with the Agricultural Research Council - Plant Protection Research Institute (ARC-PPRI) based in Rietondale with regards to guidance on the use of biological control organisms (contacts: Dr Stefan Naser at <a href="mailto:nesers@arc.agric.za">nesers@arc.agric.za</a>, Dr David Simelane at <a href="mailto:simelaned@arc.agric.za">simelaned@arc.agric.za</a>, Dr Alan Urban at <a href="mailto:urbana@arc.agric.za">urbana@arc.agric.za</a> or call 012 356 9800).</li> <li>Management can access the DWA-WfW website to download treatment guides for terrestrial AIPs or those identified at the site. Or, to request a clearing form/application for the WfW personnel to clear the site.</li> </ul>
<b>3. REMOVAL METHODS FOR AIPS</b>		

**Table 2: Alien invader plants control plan to be implemented by site management**

<b>ALIEN INVASIVE PLANTS CONTROL PLAN</b>		
<b>Method / Procedures</b>	<b>Equipment</b>	<b>Responsibility</b>
<ul style="list-style-type: none"> <li>All Category 1a &amp; b species shall be removed from the site on a continuous basis.</li> </ul> <p>Method for removal of seedlings:</p> <ul style="list-style-type: none"> <li>Seedlings and new sprouts should be removed by hand and not be allowed to reach seed bearing age.</li> <li>Seedling should be removed when the soil is wet, preferably after rainfall;</li> </ul> <p>Method for removal of mature plants:</p> <ul style="list-style-type: none"> <li>Mature plants must be cut off using a chainsaw or brush cutter as close as possible to the ground.</li> <li>Herbicides can be used for application to the stump.</li> </ul>	<ul style="list-style-type: none"> <li>Chainsaw or brush cutter is recommended (N.B. Training is crucial for operating these machines).</li> </ul>	<p><b>Stage 3:</b> Site management is responsible for removal of all AIPs as indicated in the methods.</p> <ul style="list-style-type: none"> <li>Time frame: Operational-, and decommissioning phases as well as the 12 month after care period of the prospecting activities.</li> <li>For mechanical removal of mature plants, a trained and experienced individual should be used to operate the equipment.</li> </ul>
<b>4. DISPOSAL OF AIP CUTS OR MATERIAL</b>		
<ul style="list-style-type: none"> <li>All alien plants removed from the site are to be disposed of at an approved or licensed waste disposal site if no alternative use for the plant material can be identified;</li> <li>Alternatively, the removed plants can be buried in a trench of at least 1 m deep. Grow-back will need to be controlled in this area, preferably with herbicides.</li> <li>Logs or wood can be donated to the landowner or community;</li> <li>Non-seeding woody aliens can be retained and used for dust control purposes (i.e. act as windbreakers) or soil stabilisers;</li> <li>Cut plant material should be removed from site within three days, to lower fire potential; and</li> <li>Burning of dried alien vegetation should not be allowed on site.</li> </ul>	<ul style="list-style-type: none"> <li>Preferably a contractor should be appointed for this aspect.</li> </ul>	<p><b>Stage 4:</b> The proponent should seek a contractor to oversee this phase.</p> <ul style="list-style-type: none"> <li>Time frame: Throughout control phase when deemed necessary, or at least monthly.</li> <li>Record keeping: <ul style="list-style-type: none"> <li>There should be a record of the dates the disposal truck collects the plant waste material;</li> <li>License for the disposal site; and</li> <li>License for the company tasked with collecting and disposing of the plant waste material.</li> </ul> </li> </ul>
<b>5. EARLY DETECTION AND RAPID RESPONSE (EDRR)</b>		

**Table 2: Alien invader plants control plan to be implemented by site management**

<b>ALIEN INVASIVE PLANTS CONTROL PLAN</b>		
<b>Method / Procedures</b>	<b>Equipment</b>	<b>Responsibility</b>
<ul style="list-style-type: none"> <li>• This aims to allow site management to detect and respond to new alien infestation before it escalates;</li> <li>• A monthly inspection should be established to monitor AIP infestation in areas that were re-vegetated.</li> <li>• Seedlings should be removed as explained under heading 2 before they establish and start to produce seeds;</li> <li>• EDRR should be applied in all the project areas and mostly in areas that are newly disturbed; and</li> <li>• AIPs should not be allowed to establish and mature as the bigger they become they more expensive it becomes to control.</li> </ul>	<ul style="list-style-type: none"> <li>• GPS;</li> <li>• Camera; and</li> <li>• Garden fork and gloves for loosening the soil and removing the seedlings.</li> </ul>	<p><b>Stage 5:</b> Site management is responsible to ensure that the prospecting area is protected from alien invasion.</p> <ul style="list-style-type: none"> <li>• Time frame: Operational-, and decommissioning phases as well as the 12 month after care period of the prospecting activities.</li> </ul>

## 8. REHABILITATION OF RECLAIMED AREA

Monitoring and maintenance of reclaimed areas are important to establish the necessity of follow-up operations. It is preferable to follow up on a reclaimed area and remove all seedlings or treat re-sprouting plants prior to the treatment of a new area.

Denuded areas where eradication of weeds / invader species was done needs to be rehabilitated to ensure soil conservation and prevent erosion. Denuded areas also have a much higher potential of re-infestation than areas that has been vegetated with indigenous plant species.

It is proposed that a seedmix of the following replacement plants be used to fill the areas from where the weeds / invader plants were eradicated:

- *Couch Grass (Cynodon dactylon)*
- *Red Grass (Themeda triandra)*
- *Spear Grass (Heteropogon contortus)*
- *Tef (Eragrostis tef)*
- *Weeping Love Grass (Eragrostis curvula)*

As invasive plant species can lay dormant until favourable conditions arise, monitoring of re-vegetated areas is of extreme importance and should be implemented at least quarterly. Accurate records of monitoring and maintenance actions and associated costs should be compiled to assist with future planning.

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5. **Todd S.** 2012. Alien Invasive Plant Management Plan: Solar Direct Graspan Solar Energy Facility
6. **Working for Water.** Indigenous Replacement Plants in the KZN region. Department of Water Affairs. South Africa
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8. Environment News. 2017. Alien Invasive Plants List For South Africa. <https://www.environment.co.za/weeds-invaders-alien-vegetation/alien-invasive-plants-list-for-south-africa.html>

***ANNEXURE 1: PROPOSED MANAGEMENT/CONTROL METHODS FOR THE MOST COMMON ALIEN INVADER PLANT SPECIES***

Pictures and information were obtained from the following websites:

[www.invasives.org.za](http://www.invasives.org.za)

[www.arc.agric.co.za](http://www.arc.agric.co.za);

[www.biodiversityexplorer.co.za](http://www.biodiversityexplorer.co.za);

[www.sanbi.org](http://www.sanbi.org);

[www.dwaf.gov.za](http://www.dwaf.gov.za);

[www.gardeningedden.co.za](http://www.gardeningedden.co.za) and

[www.britannica.com](http://www.britannica.com).

Please refer to Conservation of Agricultural Resources Act (Act No. 43 Of 1983) (CARA) and the National Environmental Management Biodiversity Act (NEM:BA) for a complete list of alien invasive species found in South Africa.

### Balloon vine (*Cardiospermum grandiflorum*)



<b>Category:</b>	NEMBA – Category 1b
<b>General Description:</b>	A perennial, slightly woody climber with tendrils, growing 2-5 m or higher; often draping itself over trees and other support structures. Leaves: Strongly serrated triangular-shaped leaves, bright green in colour and somewhat hairy on the surface of the leaves. Flowers: White or yellow, in many-flowered and compact heads appearing between October-January, but throughout the year in tropical climates. Fruit/Seeds: Membranous, inflated fruit capsules about 60mm long are green turning brown and carry black, round seeds with an oblong white spot.
<b>Form:</b>	Vine
<b>Distribution:</b>	Mostly the warmer parts of KwaZulu-Natal, Gauteng, Mpumalanga and Limpopo Provinces
<b>Origin &amp; effect:</b>	Tropical South America (Brazil and eastern Argentina). Overtops and smothers indigenous species, including large trees.
<b>Control Measures:</b>	<p><u>Biological control:</u> Seed-feeding weevil <i>Cissoanthonomus tuberculipennis</i> (Coleoptera: Curculionidae) and the fruit-galling midge <i>Contarinia</i> sp. (Diptera: Cecidomyiidae)</p> <p><u>Mechanical and Chemical:</u> Mechanical control of balloon vine is extremely difficult and costly, as dead plant material has to be removed to restore exposure of the understorey to sunlight. Chemical control is similarly problematic because of non-target damage to underlying vegetation.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>
<b>Replacement Species:</b>	Traveller's joy ( <i>Clematis brachiata</i> ), canary creeper ( <i>Senecio tamoides</i> ), black-eyed susan ( <i>Thunbergia alata</i> )

**BLACK WATTLE (*ACACIA MEARNSII*)**

<b>Category:</b>	NEMBA – Category 2
<b>General Description:</b>	An evergreen tree growing 5-10m high, black wattle has dark olive-green finely hairy leaves. Bark: Rough, greyish bark Leaves: Dark olive-green short leaflets (1.5-4.0mm), with fine hairs. Flowers: Small pale yellow to cream, globe-shaped flowers in large, fragrant sprays, August to September. Fruit/seeds: Finely haired, dark brown pods.
<b>Form:</b>	Tree
<b>Origin &amp; effect:</b>	Competes with and replaces indigenous grassland and riverine species. Grasslands are invaded by dense thickets of black wattle, which reduced the grazing area for domestic and wild animals.
<b>Control Measures:</b>	<p><u>Biological control:</u> Acacia seed weevils</p> <p><u>Mechanical and Chemical:</u> Seedlings &amp; Saplings: Hand pull or hoe. Foliar sprays of Mamba 360 SL (150 ml/10l water) for saplings up to 1 m at 3 l/ha; Garlon 480 EC or Viroaxe (25-75 ml/10l water) for saplings up to 1.5 m at 0.5 to 1.5 l/ha; or Touchdown Forte for saplings up to 2 m at 3 l/ha. Young trees: Foliar sprays with Garlon 480 EC or Viroaxe (75 ml/10l water) at 3 l/ha. For mature plants: Cut or frill and apply Timbrel 360 SL (300 ml/10l water) at 1.5 l/ha to freshly cut areas. Cut and apply mycoherbicide (Stumpout<sup>®</sup>) to freshly cut stumps. Use triclopyr butoxyethyl ester (Garlon 480 EC or Viroaxe) in areas where grasses occur.</p>
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.
<b>Replacement Species:</b>	karee ( <i>Rhus lancea</i> ), Weeping wattle ( <i>Peltophorum africanum</i> )

**BLACK LOCUST (*ROBINIA PSEUDOACACIA*)**

<b>Category:</b>	NEMBA – Category 1b
<b>General Description:</b>	A deciduous tree reaching up to 25m high, but often smaller with dark brown and deeply furrowed bark. Leaves: Small, bright green leaves above and paler beneath which become yellow in autumn and rounded at the tips. Flowers: White, fragrant flowers in drooping clusters appear from September to November. Fruit/seeds: Reddish-brown pods.
<b>Form:</b>	Tree
<b>Distribution:</b>	All provinces in South Africa
<b>Origin &amp; Problem:</b>	North America. Competes with and replaces indigenous species.
<b>Control Measures:</b>	<p><u>Mechanical and Chemical:</u></p> <p>Seedlings &amp; Saplings: Hand pull or hoe.</p> <p>Foliar sprays of Mamba 360 SL (150 ml/10l water) for saplings up to 1 m at 3 l/ha; Garlon 480 EC or Viroaxe (25-75 ml/10l water) for saplings up to 1.5 m at 0.5 to 1.5 l/ha; or Touchdown Forte for saplings up to 2 m at 3 l/ha.</p> <p>Young trees: Foliar sprays with Garlon 480 EC or Viroaxe (75 ml/10l water) at 3 l/ha.</p> <p>For mature plants: Cut or frill and apply Timbrel 360 SL (300 ml/10l water) at 1.5 l/ha to freshly cut areas.</p> <p>Cut and apply mycoherbicide (Stumpout<sup>®</sup>) to freshly cut stumps.</p> <p>Use triclopyr butoxyethyl ester (Garlon 480 EC or Viroaxe) in areas where grasses occur.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required.</p> <p>Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>
<b>Replacement Species:</b>	Ankle thorn ( <i>Acacia robusta</i> ), hook thorn ( <i>Acacia caffra</i> ), weeping wattle ( <i>Peltophorum africanum</i> )

### Bloodberry (*Rivina humilis*)



<b>Category:</b>	NEMBA – Category 1b
<b>General Description:</b>	A perennial herb which sometimes has a woody base and growing up to 1m high with spreading branches. Leaves: Light green, thin leaves with oval branches which narrow to a point. Flowers: White or greenish to rosy flowers from October to June. Fruit/seeds: Bright red berries
<b>Form:</b>	Herb
<b>Distribution:</b>	KwaZulu-Natal and Gauteng
<b>Origin &amp; Problem:</b>	North, Central and South America. Competes with indigenous species. Rapid growth after disturbance, forming dense stands. Competes against indigenous plants. Invasive along watercourses. Poisonous.
<b>Control Measures:</b>	<p><u>Mechanical:</u></p> <ul style="list-style-type: none"> <li>▪ Cut and remove flowers and berries before birds find them.</li> <li>▪ Young shoots can be pulled out by hand.</li> <li>▪ Mature plants need to be physically dug out by their roots.</li> <li>▪ Note: All parts of this plant are poisonous – wear protective clothing.</li> <li>▪ Ensure all root fragments are removed.</li> </ul> <p><u>Chemical:</u></p> <p>Starane 200 - Fluroxypyr (200g/l)</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required.</p> <p>Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>

### Bugweed (*Solanum mauritianum*)



<b>Category:</b>	NEMABA - Category 1b
<b>General Description:</b>	Evergreen shrub or small tree growing up to 4m high. Leaves: Leaves are bright green above, paler below, with sharply toothed margins Flowers: Bright yellow, showy, trumpet-shaped flowers in terminal sprays from October to May. Fruit/seeds: Brown, shiny fruit capsules 12-20cm long that split open to release papery winged seeds.
<b>Form:</b>	Shrub
<b>Distribution:</b>	Western Cape, Eastern Cape, KwaZulu-Natal, Mpumalanga, Gauteng, and Limpopo
<b>Origin &amp; Problem:</b>	South America. It competes with and replaces indigenous riverine and forest margin species. Also competes with young trees in plantations, particularly pines and black wattle, inhibiting growth and causing stem deformation. It is a host of the KwaZulu-Natal fruit fly which is an economic pest. It has no fodder value and the plants are generally avoided by grazing animals. The unripe fruits are poisonous and the hairy leaves and stems can cause allergic dermatitis and asthma.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.
<b>Replacement Species:</b>	Cape honeysuckle ( <i>Tecoma capensis</i> ), yellow bauhinia ( <i>Bauhinia tomentosa</i> ), weeping wattle ( <i>Peltophorum africanum</i> ).

### Butterfly orchid tree (*Bauhinia purpurea*)



<b>Category:</b>	NEMBA – Category 1b
<b>General Description:</b>	The butterfly orchid tree grows up to 6-10m high. Leaves are thick, deeply divided into two lobes and 100mm long. Flowers are colourful in shades of blotched pink to red striped, as well as cream or purple. They are 80-100mm wide with narrow, non-overlapping petals and three fertile stamens. The fruits consist of green elongated pods which turn dark brown.
<b>Form:</b>	Evergreen Tree
<b>Distribution:</b>	Butterfly orchid tree is mostly found in KwaZulu- Natal, Gauteng, Limpopo and Mpumalanga Provinces.
<b>Origin &amp; Problem:</b>	Asia. It competes with and replaces indigenous species.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

**CASTOR-OIL PLANT (*RICINUS COMMUNIS*)**

<b>Category:</b>	NEMBA – Category 2
<b>General Description:</b>	A very distinctive plant with green, spreading star-shaped leaves and tall, spiky fruit capsules. Leaves: Shiny, star-shaped dark green or reddish leaves that are paler below with serrated margins. Flowers: Upper flowers are reddish and lower flowers cream. Fruit/seeds: Green, brown or reddish, three-lobed capsules covered with soft spines protruding from the top of the plant.
<b>Form:</b>	Shrub
<b>Distribution:</b>	All provinces of South Africa
<b>Origin &amp; Problem:</b>	Tropical Africa. Competes with indigenous pioneering species especially in watercourses. Extremely poisonous.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

## COMMON THORN APPLE (*DATURA STRAMONIUM*)



<b>Category:</b>	NEMBA – Category 1b – Declared weed. Destroy.
<b>Form:</b>	Herbaceous shrub
<b>General Description:</b>	General description: Sparsely hairy, green, brown or purple, erect annual herb growing up to 1,5m in height. Leaves: Dark green or purple and paler underneath with the margins coarsely and irregularly toothed or lobed, bad-smelling. Flowers: White, mauve or purplish, narrowly funnel-shaped flowers. Fruit/Seeds: Brown, hardened capsules covered with slender spines.
<b>Origin &amp; Problem:</b>	Tropical America. It competes with indigenous species.
<b>Distribution:</b>	Found throughout South Africa.
<b>Control Measures:</b>	<u>Mechanical:</u> Physical hand-pulling removal of the plants. This should be done when not seeding. If seeding then the seed heads should be carefully removed and burnt. Tillage will work to some extent with seedlings. <u>Chemical:</u> <i>Datura stramonium</i> is susceptible to a range of soil and foliar herbicides available for agricultural markets.
<b>Monitoring Measures:</b>	Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation. Sites will need to be revisited monthly to cut back any re-growth. With the removal of plants soils may become exposed and should be re-vegetated with grasses and/or indigenous species mentioned below.
<b>Replacement Species:</b>	Indigenous, local grasses.

**COMMON MORNING GLORY (*IPOMEA PURPEA*)**

<b>Category:</b>	NEMBA – Category 1b
<b>General Description:</b>	Herbaceous twining annual with hairy stems up to 3m or more The bark is brown-grey to blackish, and fissured at the base. Leaves: Bright green, sparsely hairy, heart-shaped leaves. Flowers: Purplish-blue, reddish, magenta or white, sometimes with contrasting stripes, funnel-shaped, to 85mm long; sepals pointed but not long-tapering, 10-15 mm long, bristly at base. Flowers usually appear in November-May, but throughout the year in tropical regions. Fruit/Seeds: Produces globose capsules of 10mm measured across.
<b>Form:</b>	Shrub
<b>Distribution:</b>	Gauteng, Limpopo, Mpumalanga, KwaZulu-Natal and Eastern Cape.
<b>Origin &amp; Problem:</b>	Tropical America. Scrambles over and competes with other species. It is an annual plant and has less impact than the similar <i>Ipomoea indica</i> which is perennial.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.
<b>Replacement Species:</b>	Indigenous morning glories or large flowered <i>Clematis</i>

### Dalmatian toadflax (*Linaria dalmatica*)



<b>Category:</b>	NEMBA – Category 1b
<b>General Description:</b>	It looks like a large, yellow snapdragon and has fast-growing, strong, horizontal roots. Leaves: Alternate, pale blue–green, waxy, oval to broadly lance–shaped with pointed tips, 20–60mm long and 20–40mm wide, sub erect, rigid, clasping the stem. Flowers: Golden–yellow with an orange–brown throat, corolla cylindrical, large, 20–50mm long, with a basal spur 4–25mm long, in large, rather loose inflorescences of 10–50 flowers, summer-flowering. Fruit/seeds: Capsule globose, 3–7mm long, seeds wingless.
<b>Form:</b>	Herb
<b>Distribution:</b>	Gauteng, Free State, KwaZulu-Natal, Eastern Cape and Western Cape.
<b>Origin &amp; Problem:</b>	Western Asia and South eastern Europe. It contains an iridoid glycoside, a quinoline alkaloid and a peganine, so it is toxic to livestock such as cattle.
<b>Control Measures:</b>	<p><u>Mechanical:</u></p> <p>Small patches of toadflax can be hand-pulled for five or six years to deplete the energy reserves of the root system. "Pulling or cultivating young Dalmatian and yellow toadflax plants in small infestations before they go to seed will provide control, even eradication, if done consistently for several years. It is important to remove the lateral roots completely, since root fragments can survive to grow new plants. Viable seeds in the soil may continue to germinate for 10 to 15 years.</p> <p><u>Chemical:</u></p> <p>Starane 200 - Fluroxypyr (200g/l)</p> <p>Triclopyr butoxyethyl ester and Triclopyr triethylammonium salt</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>The site will need to be revisited several times per season to completely eradicate these toadflaxes if pulling, plowing or cultivating is used for control."</p>

**DENSE-THORNED BITTER APPLE (*SOLANUM SISYMBRIFOLIUM*)**

<b>Category:</b>	NEMBA – Category 1b – Declared weed. Destroy.
<b>Description:</b>	A very spiny low shrub with many branches up to 1,5m high covered with sticky, glandular hairs and bright orange-red to brown-yellow spines up to 20mm long. It has an extensive root system. The leaves are dull green, hairy, deeply lobed and toothed and have prominent spines on the midrib and veins. White, cream or bluish flowers appear all year. The fruits are shiny green berries turning bright red. The unripe fruit is poisonous.
<b>Form:</b>	Shrub
<b>Distribution:</b>	Western and Eastern Cape, KwaZulu-Natal, Mpumalanga, Gauteng and Limpopo Provinces
<b>Origin &amp; Problem:</b>	Brazil, Argentina, Uruguay and Paraguay in South America. It competes with crop plants and indigenous pioneering species. Poisonous.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after treatment. Heavily infested areas should be revisited and treated if and as necessary every 6 months.
<b>Replacement Species:</b>	Indigenous, local grass species.

**EXOTIC BRAMBLES (*RUBUS SPP*)**



<b>Category:</b>	NEMBA – Category 1a and 1b
<b>General Description:</b>	<i>Rubus</i> is a large genus of flowering plants in the rose family, Rosaceae, subfamily Rosoideae. Raspberries, blackberries, and dewberries are common, widely distributed members of the genus. Most of these plants have woody stems with prickles like roses; spines, bristles, and gland-tipped hairs are also common in the genus.
<b>Form:</b>	Shrub
<b>Origin &amp; Problem:</b>	America and Europe. All <i>Rubus spp.</i> are thorny and can form thickets, however, it is only the alien species that form extensive thickets and that cause serious problems in grazing lands, in forestry plantations, and along roadsides.
<b>Distribution:</b>	Western and Eastern Cape, KwaZulu-Natal, Mpumalanga, Gauteng and Limpopo Provinces
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

## Red sesbania (*Sesbania punicea*)



<b>Category:</b>	NEMBA – Category 1b
<b>Description:</b>	A deciduous shrub or small tree growing up to 4m in height and has numerous slender branches. Leaves: Dark green, drooping, 100-200mm long, paired leaflets. Flowers: Red or orange flowers appear in dense sprays up to 25cm long from September to March. Fruit/seeds: Distinctive four-winged oblong brown pods 60-80mm long.
<b>Distribution:</b>	All provinces in South Africa.
<b>Form:</b>	Shrub
<b>Origin &amp; Problem:</b>	South America. Competes with and replaces indigenous riverine and wetland species. Poisonous, especially the seeds, which are lethal to birds, mammals and reptiles.
<b>Control Measures:</b>	<p><b><u>Mechanical eradication</u></b></p> <ul style="list-style-type: none"> <li>✦ Pull out during seedlings stage (before seed ripens)</li> <li>✦ Disposal of eradicated plants: <ul style="list-style-type: none"> <li>▪ Dispose with general waste,</li> <li>▪ Use in areas prone to erosions,</li> <li>▪ Dispose of plant material into quarry pit.</li> </ul> </li> <li>✦ If seeds have ripened, pull out plants while making sure seeds do not fall out.</li> <li>✦ Place plants in a black plastic bag and dispose of at an incineration facility to be destroyed.</li> <li>✦ File proof of delivery to the facility.</li> <li>✦ Alternatively, the removed plants can be buried in a trench of at least 1m deep. Grow-back will need to be controlled in this area, preferably with herbicides.</li> </ul> <p><b><u>Herbicides</u></b></p> <p>Apply as specified by supplier</p> <p><b>Foliar Spray (Seedlings &lt;1m):</b> Roundup 360 SL, Roundup Max 680 WG, Glyph 360 SL, Mamba 360 SL, Mamba Max 480 SL, Springbok 360</p> <p><b>Foliar Spray (Seedlings 1 – 2 m):</b> Roundup Max 680 WG, Glyph 360 SL, Mamba 360 SL, Roundup 360 SL; Garlon 4 EC <b>Foliar Spray (Adult):</b> Roundup Max 680 WG, Chopper 100 SL, Hatchet 100 SL</p>
<b>Replacement Species:</b>	Dwarf coral tree ( <i>Erythrina humeana</i> ), September bush ( <i>Polygala myrtifolia</i> ), purple broom ( <i>Polygala virgata</i> ), wild pomegranate ( <i>Burchellia bubalina</i> )



### Fountain grass (*Pennisetum setaceum*)



<b>Category:</b>	Existing legislation: CARA 2002 – Category 1 NEMBA – Category 1b
<b>Distribution:</b>	KwaZulu Natal and Gauteng
<b>Description:</b>	General description: A tussock-forming perennial grass with feathery, spike-like inflorescences. The bristles are long and detach with the spikelets. Flowers: The inflorescence is about 100-250mm long and rose or purple-coloured. Fruit/Seeds: Small seeds
<b>Form:</b>	Grass
<b>Origin &amp; Problem:</b>	North Africa. Forms stands along road verges and in other disturbed sites with the potential to spread into adjacent natural veld.
<b>Control Measures:</b>	<u>Chemical:</u> Taskforce at 0.56 and 0.75 kg/ha for mature grass <u>Mechanical:</u> Physical removal of the plants, including the underground parts. This should be done when not seeding. If seeding, then the seed heads should be carefully removed and burnt.
<b>Monitoring Measures:</b>	Photographic records should be kept and photographs taken on each site visit in areas of heavy infestation. Sites will need to be revisited, monthly to cut back and re-growth. With the removal of plants soils may become exposed and should be re-vegetated with grasses or indigenous species, mentioned below.
<b>Replacement Species:</b>	Bristle leaf red top ( <i>Melinus nerviglumis</i> ), Natal red top ( <i>Melinus repens</i> ), red grass ( <i>Themeda triandra</i> ), weeping anthericum ( <i>Chlorophytum saundersiae</i> )

### Giant sensitive tree (*Mimosa pigra*)



<b>Category:</b>	NEMBA Category 1b.
<b>General Description:</b>	When mature, the giant sensitive tree is an erect, much branched, prickly shrub reaching a height of 3-6m. Stems are 3m long, greenish at first, becoming woody, and have randomly scattered, slightly recurved prickles 0.5-1cm long. Leaves: Bright green, feathery and fern-like, 10-20cm long. Flowers: The flowers are pink or mauve, small, regular and grouped into globular heads 1-2cm in diameter. Fruit/seeds: The fruit is a thick hairy, 20-25 seeded, flattened pod borne in groups in the leaf axils, each 6.5-7.5cm long and 0.7-1cm wide. The fruit turns brown when mature, breaking into one-seeded segments. The seeds are brown or olive green, oblong, flattened, 4-6mm long and 2mm wide.
<b>Form:</b>	Shrub
<b>Distribution:</b>	KwaZulu-Natal, Free State, Mpumalanga, North West, Gauteng, Limpopo.
<b>Origin and Problem:</b>	Brazil. It chokes out cane, crops and grassland, resulting in reduced land value and environmental degradation.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

**HIMALAYAN FIRETHORN (*PYRACANTHA CRENULATA*)**

<b>Category:</b>	NEMBA Category 1b.
<b>Description:</b>	An evergreen shrub or small tree. It has spiny branches bearing simple leaves. Leaves: It has glossy green leaves up to 5cm long and 8mm wide. Flowers: Flowers are white with five petals and numerous stamens, 8–12mm across, occurring in clusters of 30 flowers along short stems. Fruit/seeds: Fruit is red, orange or yellow and occur along the stems where the flowers were. Berries look like tiny apples, 5–9mm in diameter, and contain seeds. The seeds are brown and irregular in shape, about 2.5mm across.
<b>Form:</b>	Shrub
<b>Origin &amp; Problem:</b>	Western China. The seeds are poisonous if ingested and may result in vomiting.
<b>Distribution:</b>	Mpumalanga, Gauteng, Northern Cape, Limpopo, Free State and Eastern Cape.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

## FOUR O`CLOCK (MIRABILIS JALAPA)



<b>Category:</b>	NEMBA – Category 1b
<b>Description:</b>	<p>Four o' clock is a bushy, tender perennial that typically grows tall on erect, branching stems. It is an old garden favourite that features fragrant, funnel-shaped, tubular flowers with five flaring petal-like lobes. Flowers bloom from early/mid-summer to autumn. Flowers open in the late afternoon (around four o'clock) and stay open only until the following morning.</p> <p>Leaves: Opposite, slightly pointed oval leaves and multi-branching stems. Flowers: Trumpet-shaped, five-petal flowers come in pink, red, yellow, white and some bi-colours. 30–50mm long. Flowers have a slight vanilla scent and open in the late afternoon through the evening.</p> <p>Fruit/seeds: The seeds are egg-shaped, hairy and greyish brown, with five lengthwise ribs. The fruit is a small, one-seeded capsule (anthocarp). Rounded nut-like fruit 7-11mm long and turning wrinkled and black when mature.</p>
<b>Form:</b>	Tree
<b>Distribution:</b>	Largely confined to Gauteng Province, with scattered records from Limpopo, Mpumalanga and North West Province.
<b>Control Measures:</b>	<u>Mechanical:</u> Mechanical removal.
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required.</p> <p>Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>
<b>Replacement Species:</b>	<p><i>Leucosidea sericea</i></p> <p><i>Combretum erythrophyllum</i></p>

## HONEY LOCUST (GLEDITSIA TRIACANTHOS)



<b>Category:</b>	NEMBA – Category 1b
<b>General Description:</b>	A deciduous, spreading tree 15-20m tall. The trunk and branches have three-branched spines. Bright green bi-pinnate leaves consist of small paired lance-shaped and minutely toothed. Small, yellowish-green flowers appear from October to November. The seed capsules are flat and twisted brown pods.
<b>Origin and problem:</b>	North America. It competes with and replaces indigenous species. Dense stands along watercourses could significantly reduce stream flow
<b>Form:</b>	Tree
<b>Distribution:</b>	Western Cape, Eastern Cape, KwaZulu-Natal, Free State, Gauteng and Mpumalanga
<b>Control Measures:</b>	<u>Mechanical &amp; Chemical:</u> Herbicides are usually required to effectively control trees when cut. Several herbicides have been labelled for honey locust control through various application techniques, including basal bark, thin line basal bark, cut stump, frill or girdle, and foliar applications. However, picloram, one of the most effective herbicides on honey locust, is not labelled for individual basal bark or cut stump treatment in grazed pasture. Aminopyralid recently received a new label addition for individual tree treatment of honey locust in grazed pasture.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

**JACARANDA (*JACARANDA MIMOSIFOLIA*)**

<b>Category:</b>	<ul style="list-style-type: none"> <li>a. 1b in Gauteng, Kwa-Zulu Natal, Limpopo, Mpumalanga and North West provinces</li> <li>b. Not listed for urban areas in Gauteng, Kwa-Zulu Natal, Limpopo, Mpumalanga and North West provinces</li> <li>c. Not listed within 50m of the main house on a farms in Gauteng, Kwa-Zulu Natal, Limpopo, Mpumalanga and North West provinces, for threes with a diameter of more than 400mm and 1000mm height at this time of publishing this notice</li> </ul> <p>Not listed elsewhere.</p>
<b>General Description:</b>	Deciduous or semi-deciduous tree up to 22m high with a rounded, spreading crown. Leaves: Divided, slightly hairy fern-like leaves which are dark green, but turn yellow in late autumn or winter. Flowers: Attractive mauve-blue to lilac or rarely white, tubular flowers produced in pyramidal sprays at the ends of usually leafless branches, flowering from September-November. Fruit/Seeds: Distinct, purse-shaped oval, flattish, woody green capsules about 60mm long, which turn brown and split open after about a year to release numerous flat, winged seeds
<b>Form:</b>	Tree
<b>Distribution:</b>	Common throughout Mpumalanga, Limpopo, Gauteng and KwaZulu-Natal Provinces.
<b>Origin &amp; Problem:</b>	South America (north-west Argentina). Competes with and replaces indigenous species. Dense stands along watercourses are likely to reduce stream flow.

<b>Control Measures:</b>	<u>Biological control:</u> Acacia seed weevils  <u>Mechanical and Chemical:</u> Seedlings & Saplings: Hand pull or hoe. Foliar sprays: Garlon 480 EC or Viroaxe (25-50 ml/10l water) at 0.5 to 2 l/ha. Trees up to 1.5 m: Foliar sprays with Garlon 480 EC or Viroaxe (75 ml/10l water) at 3 l/ha. For mature trees: Cut stump and apply Timbrel 360 SL (300 ml/10l water) at 1.5 l/ha or Mamba 360 SL (200 ml/10l water) at 6 l/ha to freshly cut areas. Frill and apply Mamba 360 SL (2 l/10l water) at 6 l/ha.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.
<b>Replacement Species:</b>	Tree wisteria ( <i>Bolusanthus speciosus</i> ), coral tree ( <i>Erythrina lysistemon</i> ), pom pom tree ( <i>Dais cotinifolia</i> ), and Cape chestnut ( <i>Calodendrum capense</i> ).

**KIKUYA GRASS (*PENNISETUM CLANDESTINUM*)**

<b>Category:</b>	NEMBA – Category 1b in protected areas and wetlands in which it does not already occur
<b>Description:</b>	A rhizomatous grass with matted roots and a grass-like or herbaceous habit. It is a prostrate perennial, which may form a loose sward up to 46cm high when ungrazed, but under grazing or mowing, it assumes a dense turf. The grass spreads vigorously from rhizomes and stolons, which root readily at the nodes and are profusely branched.
<b>Form:</b>	Grass
<b>Distribution:</b>	Gauteng, KwaZulu-Natal, Eastern Cape, Mpumalanga, Limpopo and Free State.
<b>Origin &amp; Problem:</b>	East Africa. Kikuyu grass forms a thick mat that crowds out desirable species. On golf courses it often invades greens.
<b>Control Measures:</b>	<p><u>Chemical:</u> Taskforce at 0.56 and 0.75 kg/ha for mature grass</p> <p><u>Mechanical:</u> Physical removal of the plants, including the underground parts. This should be done when not seeding. If seeding then the seed heads should be carefully removed and burnt.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept and photographs taken on each site visit in areas of heavy infestation.</p> <p>Sites will need to be revisited, monthly to cut back and re-growth.</p> <p>With the removal of plants soils may become exposed and should be re-vegetated with grasses or indigenous species, mentioned below.</p>
<b>Replacement Species:</b>	<p><i>Themeda triandra</i></p> <p><i>Melinis repens</i></p>

**LARGE COCKLEBUR (*XANTHIUM STRUMARIUM*)**

<b>Category:</b>	NEMBA – Category 1b – Declared weed. Destroy.
<b>Description:</b>	This is an herbaceous shrub growing up to 1,2m high. The erect stems are brownish or reddish-brown, often with red spots, ribbed and roughly downy. The leaves are dull green, and broad, three-lobed with serrated margins and downy on both sides. Brownish burrs up to 2cm long crowned with two stout horns and covered with hooked spines up to 4mm long.
<b>Form:</b>	Herbaceous shrub
<b>Distribution:</b>	Throughout all provinces in South Africa, particularly the eastern regions.
<b>Origin &amp; Problem:</b>	Competes with crop plants and indigenous species along riverbanks. Its spiny burrs adhere to the wool of sheep wool and becomes entwined in tails, manes and coats of domestic livestock, causing the animals much discomfort. The seedlings are particularly toxic to domestic livestock. It readily invades overgrazed pastures and spreads at the expense of the indigenous species.
<b>Control Measures:</b>	<p><u>Mechanical:</u> Hand pull. Remove underground parts preferably when not seeding. Remove seed heads carefully and dispose of.</p> <p><u>Chemical:</u> Susceptible to a range of soil and foliar herbicides available for agricultural markets.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after treatment.</p> <p>Heavily infested areas should be revisited and treated if and as necessary every 6 months.</p>
<b>Replacement Species:</b>	Indigenous, local grass species.

**LARGE THORN APPLE (*DATURA FEROX*)**

<b>Category:</b>	NEMBA – Category 1b – Declared weed. Destroy.
<b>Form:</b>	Herbaceous shrub
<b>General Description:</b>	An erect, sub-herbaceous annual growing up to 1,5m high. The stem is sparsely hairy and pale green in colour. Leaves: Relatively large leaves up to 200mm long with an irregular strongly toothed margin, dark green upper surface and paler underneath the surface of the leaves. Flowers: Funnel-shaped white flowers up to 65mm long appear during summer from October-March. Fruit/Seeds: Produces brown fruit capsules covered with hard spines and numerous tiny black seeds.
<b>Origin &amp; Problem:</b>	Tropical America. It competes with indigenous species.
<b>Distribution:</b>	Found throughout all provinces in South Africa.
<b>Control Measures:</b>	<p><u>Mechanical:</u> Physical removal of the plants, including the underground parts. This should be done when not seeding. If seeding then the seed heads should be carefully removed and burnt.</p> <p><u>Chemical:</u> <i>Datura ferox</i> is susceptible to glyphosate herbicides.</p>
<b>Monitoring Measures:</b>	<p>Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation.</p> <p>Sites will need to be revisited monthly to cut back any re-growth.</p> <p>With the removal of plants soils may become exposed and should be re-vegetated with grasses and/or indigenous species mentioned below.</p>
<b>Replacement Species:</b>	Indigenous, local grasses.

### Madagascar periwinkle (*Catharanthus roseus*)



<b>Category:</b>	NEMBA Category 1b.
<b>Form:</b>	Shrub
<b>Distribution:</b>	KwaZulu-Natal, Limpopo and Gauteng Provinces.
<b>General Description:</b>	It is an ever green shrub or herbaceous plant growing to 1m tall. The leaves are oval to oblong, 2.5-9cm long and 1.3-5cm broad, glossy green, hairless, with a pale midrib and a short petiole 1-1.8cm long; they are arranged in opposite pairs. Flowers: The flowers are white to dark pink with a darker red centre, with a basal tube 2.5-3cm long and a corolla 2-5cm diameter with five petal-like lobes. Fruit/seeds: The fruit is a pair of follicles 2-4cm long and 3mm broad.
<b>Origin &amp; Problem:</b>	Madagascar. Competes with indigenous species and it is poisonous.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation.

### Mauritius thorn (*Caesalpinia decapetala*)



<b>Category:</b>	NEMBA Category 1b.
<b>Form:</b>	Shrub
<b>Distribution:</b>	KwaZulu-Natal, Limpopo and Gauteng Provinces.
<b>General Description:</b>	A thorny evergreen shrub growing 2-4m high or climbs to 10 or higher. Leaves: Small bi-pinnate leaves which are dark green and paler underneath, not glossy. Flowers: Flowers are pale yellow in colour and appear as small tufted balls which flower from May-November. Fruit/Seeds: Produces brown woody seed pods.
<b>Origin &amp; Problem:</b>	Asia (India, Sri Lanka, China, Japan & Malaysia). Scrambles over and smothers other indigenous species and also forms dense stands along watercourses, which are likely to reduce stream flow.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation.

### Midnight lady (*Harrisia pomanensis*)



<b>Category:</b>	NEMBA – Category 1b
<b>Form:</b>	Succulent
<b>Distribution:</b>	Western Cape, Eastern Cape, KwaZulu-Natal, Mpumalanga, northern Gauteng and Limpopo
<b>General Description:</b>	Midnight lady is a perennial with spiny, fleshy-jointed stems. The stems are ribbed lengthwise with six ribs. Leaves are small, insignificant and deciduous and are reduced into spines. Flowers: The large, showy flowers (15-20cm long) are borne singly along the stems. They consist of many white or pinkish petals that are fused together into a tube at the base. Fruit/seeds: The fleshy fruit are bright red when mature and almost rounded in shape. These fruit (2-6cm across) are covered in small swellings (areoles) on which groups of 3-5 spines are sometimes borne.
<b>Origin &amp; Problem:</b>	Southern South America. It forms dense infestations that reduce pastures by choking out other pasture species. The spines interfere with stock mustering and movement, and cause injuries and lameness to stock.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation.

### Moon cactus (*Harrisia martini*)



<b>Category:</b>	Category 1 NEMBA – Category 1b
<b>Form:</b>	Succulent
<b>Distribution:</b>	Western Cape, Eastern Cape, Free State, KwaZulu-Natal, Gauteng and Limpopo
<b>General Description:</b>	Spiny, succulent shrub 1-3m high with long, much-branched stems often arching downwards and rooting where they touch the ground. Spines in groups, with one or two central spines much longer than the others. No leaves. Showy white nocturnal flowers appear from November to January. Bright pinkish-red, succulent berries
<b>Origin &amp; Problem:</b>	South America (Argentina). Competes with indigenous species. In savanna it grows under the crowns of trees, thus barring access to shade for domestic and wild animals. Where it has started forming infestations it reduces the carrying capacity of the land and its many spines can cause injuries to grazing animals Spines cause irritation to skin.
<b>Control Measures:</b>	<u>Biological:</u> Biological control is the preferred control option, and two biocontrol agents are available in South Africa. They are a mealybug, <i>Hypogeococcus festerianus</i> that causes stunted and distorted growth before eventually killing the plant, and a long-horn stemborer, <i>Nealcidion cereicola</i> , which tunnels in the stems and also has the potential to kill the plant.
<b>Monitoring Measures:</b>	Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation.
<b>Replacement species:</b>	Basuto kraal aloe ( <i>Aloe tenuior</i> ), climbing aloe ( <i>Aloe ciliaris</i> )

### Moth catcher (*A raujia sericifera*)



<b>Category:</b>	NEMBA – Category 1b
<b>Form:</b>	Shrub
<b>Distribution:</b>	Eastern Cape, KwaZulu-Natal, Western Cape, Free State, Gauteng and Mpumalanga
<b>General Description:</b>	A vigorous climber with milky sap growing to 5m or higher. Leaves are dark green and smooth above and pale green or whitish below with short, dense hairs. White, cream or pale pink flowers appear from November to April. Green, spongy fruits which turn brown and woody and split to release numerous blackish seeds. Poisonous, causing skin irritation
<b>Origin &amp; Problem:</b>	South America. Overtops and smothers other species and produces poisonous milky latex and seeds.
<b>Control Measures:</b>	<u>Mechanical:</u> Physical removal of the plant. Remove as much root as possible. Fast grower! Do not allow to bear fruit
<b>Monitoring Measures:</b>	Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation.
<b>Replacement Species:</b>	Traveller's joy ( <i>Clematis brachiata</i> ), flowering ivy ( <i>Senecio macroglossus</i> ), starry wild jasmine ( <i>Jasminum multipartitum</i> ).

**PAMPAS GRASS (*CORTADERIA SELLOANA*)**

<b>Category:</b>	Category 1b b. Sterile cultivars or hybrids are not listed.
<b>Form:</b>	Grass
<b>General Description:</b>	A robust, tussock grass growing up to 3,5m in diameter with flowering stalks reaching 4m high. Leaves: Long slender leaves with narrowly tapering tips and grey or bluish-green in colour, often v-shaped in cross-section with rough margins. Flowers: Feathery silvery-white to pink or mauve flowers appearing from February-April. Fruit/Seeds: Produces from an open panicle, containing a large number of seeds.
<b>Distribution:</b>	Western Cape, Eastern Cape, KwaZulu-Natal and Gauteng
<b>Origin &amp; Problem:</b>	South America (Brazil, Uruguay, Paraguay, Argentina and Chile). It forms large clumps which displace smaller indigenous species.
<b>Control Measures:</b>	<p><u>Mechanical:</u> Physical removal of the plants is effective if they are small enough.</p> <p><u>Chemical:</u> Herbicides have been recommended (Amino triazol and dalapon) but the contractor should take serious precaution before using.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required.</p> <p>Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>
<b>Replacement Species:</b>	East coast broomgrass ( <i>Miscanthus capensis</i> ), riverbed grass ( <i>Pennisetum macrourum</i> ), Cape thatching grass ( <i>Chondropetalum tectorum</i> ), papyrus ( <i>Cyperus papyrus</i> )

**PEARL ACACIA (*ACACIA PODALYRIFOLIA*)**

<b>Category:</b>	Category 3 NEMBA – Category 1b
<b>Description:</b>	A small evergreen shrub or tree growing 3-6m high, with silvery-grey to dull green, oval, velvety leaves. Bark: Smooth or ultimately fissured, grey bark. Leaves: Short, oval or elliptic, silvery-grey to dull-green, velvety leaves. Flowers: Bright yellow, spherical flower heads in long, showy sprays from June-August. Fruit/seeds: Greyish-brown velvety pods.
<b>Form:</b>	Shrub
<b>Distribution:</b>	Western Cape, Kwa-Zulu Natal, Gauteng and Mpumalanga
<b>Origin &amp; Problem:</b>	Australia. Competes with and has the potential to replace indigenous species.
<b>Control Measures:</b>	<p><u>Biological control:</u> Acacia seed weevils</p> <p><u>Mechanical and Chemical:</u> <b>Seedlings &amp; Saplings:</b> Hand pull or hoe. Foliar sprays: Garlon 480 EC or Viroaxe (25-50 ml/10l water) at 0.5 to 2 l/ha. <b>Trees up to 1.5 m:</b> Foliar sprays with Garlon 480 EC or Viroaxe (75 ml/10l water) at 3 l/ha. <b>For mature trees:</b> Cut stump and apply Timbrel 360 SL (300 ml/10l water) at 1.5 l/ha or Mamba 360 SL (200 ml/10l water) at 6 l/ha to freshly cut areas. Frill and apply Mamba 360 SL (2 l/10l water) at 6 l/ha.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required.</p> <p>Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>
<b>Replacement Species:</b>	False olive ( <i>Buddleja saligna</i> )

**PERESKIA (PERESKIA ACULEATE)**

<b>Category:</b>	NEMBA – Category 1b
<b>Description:</b>	Spiny, clambering vine with long slender branches, growing 2-10m or higher and resembling bougainvillea. Young stems and leaves semi-succulent with pairs of short, hooked spines in the leaf axils. The older stems are woody with clusters of hard, straight spines 30-40mm long. Leaves: Bright green to yellowish, lance-shaped leaves. Flowers: White, cream or yellow flowers appearing from March-July and lemon-scented. Fruit/Seeds: Succulent berries about 20mm across, initially green then turning yellow.
<b>Form:</b>	Shrub
<b>Distribution:</b>	Mostly in the Eastern Cape and KwaZulu-Natal, as well as scattered parts of Gauteng, Mpumalanga and Limpopo Provinces
<b>Origin &amp; Problem:</b>	West Indies and South America (Brazil and Argentina). It overtops and smothers other species, including large forest and plantation trees. Obstructs access to forests and plantations.
<b>Control Measures:</b>	<i>Biological: A new potential biocontrol agent for Pereskia aculeate, Catorhintha schaffneri (Correidae) was subjected to host specificity testing.</i>
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

### Pompom Weed (*Campuloclinium marcrophalum*)



<b>Category:</b>	Existing legislation: CARA 2002 – Category 1 NEMBA – Category 1b
<b>Distribution:</b>	Grassland regions of Gauteng, Kwazulu-Natal, Limpopo, Mpumalanga and the Eastern Cape Provinces
<b>General Description:</b>	A tall erect perennial herb with pink fluffy flower heads and leaves concentrated on the base of the plant. Bark: Green to purple covered with rough bristly hairs. Leaves: Light green with serrated margins and lance-shaped, becoming small and more distant upwards. Flowers: Pink and are produced in dense clusters at the end of aerial stems, flower-head consists of hundreds of tiny, star shaped florets surrounded by purple bracts. Flowers in late summer during December-March. Fruit/Seeds: Brown, one-seeded achenes.
<b>Origin &amp; Problem:</b>	Central and South America (Mexico to Argentina). It causes serious degradation of the veld, lowering the biodiversity and reducing the grazing capacity by being unpalatable to large herbivores.
<b>Form:</b>	Weed
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

**PURPLE PAMPAS GRASS (*CORTADERIA JUBATA*)**

<b>Category:</b>	Category 1 NEMBA – Category 1b
<b>Form:</b>	Grass
<b>General Description:</b>	General description: Robust, tussock grass up to 3m in diameter with flowering stalks reaching up to 3m high. Leaves: Bright green, long and slender blades which are flat to slightly v-shaped in profile with rough, cutting margins rough. Flowers: Yellowish or purple, loosely branching and feathery appearing from November-February.
<b>Distribution:</b>	Mostly in Gauteng
<b>Origin &amp; Problem:</b>	West tropical South America (Ecuador and Peru to Argentina). It competes and tends to replace indigenous vegetation.
<b>Control Measures:</b>	<p><u>Mechanical:</u> Physical removal of the plants is effective if they are small enough.</p> <p><u>Chemical:</u> Herbicides have been recommended (Amino triazol and dalapon) but the contractor should take serious precaution before using.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required.</p> <p>Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>

**RED RIVER GUM (*EUCALYPTUS CAMALDULENSIS*)**

<b>Category:</b>	<p>a. 1b within</p> <ol style="list-style-type: none"> <li>i. Riparian areas</li> <li>ii. A protected area as declared by the protected areas act</li> <li>iii. Within a listed ecosystem or an ecosystem identified for conservation in terms of a bioregional plan or biodiversity management plans published under the act</li> </ol> <p>b. Not listed in the Nama-Karoo, Succulent Karoo and Desert biomes, excluding within any area mentioned in (a) above.</p> <p>c. Category 1b in fynbos, grassland, savanna, Albany thicket, forest and Indian ocean belt biomes but</p> <ol style="list-style-type: none"> <li>i. Category 2 for plantations, woodlots, bee-forage areas, wind rows and the lining of avenues</li> <li>ii. Not listed within cultivated land that is at least 50m away from untransformed land, but excluding within any area in (a) above</li> <li>iii. Not listed within 50m of the main house of a farm but excluding in (a) above</li> <li>iv. Not listed in urban areas for trees with a diameter of more than 400mm at 1000m height at the time of publishing this notice.</li> </ol>
<b>Form:</b>	Tree
<b>Distribution:</b>	Throughout South Africa, particularly in the Western Cape, Northern Cape, Gauteng and Free State.
<b>Origin &amp; Problem:</b>	Australia. It competes with and replaces indigenous riverine species. Extensive stands along watercourses are likely to cause a significant reduction in stream flow.
<b>Control Measures:</b>	<p><u>Mechanical &amp; Chemical</u></p> <p><b>Seedlings:</b> Hand pull</p> <p><b>Coppice/woody growth:</b> Foliar sprays of Brush Off at 200 g/ha and Mamba 360 SL at 3 l/ha.</p> <p><b>Felled trees:</b> Cut stumps apply Chopper (1250 ml/10 l water) at 6 l/ha.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required.</p> <p>Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>
<b>Replacement Species:</b>	Indigenous, local grass species in low infestation. Specialists input may be required in heavily infested areas.

**RED SESBANIA (*SESBANIA PUNICEA*)**

<b>Category:</b>	Category 1 NEMBA – Category 1b
<b>Form:</b>	Shrub
<b>Distribution:</b>	Found in all provinces of South Africa.
<b>General Description:</b>	A deciduous shrub or small tree growing up to 4m in height and has numerous slender branches. Leaves: Dark green, drooping, 100-200mm long, paired leaflets. Flowers: Red or orange flowers appear in dense sprays up to 25cm long from September to March. Fruit/seeds: Distinctive four-winged oblong brown pods 60-80mm long.
<b>Origin &amp; Problem:</b>	South America. Competes with and replaces indigenous riverine and wetland species. Poisonous, especially the seeds, which are lethal to birds, mammals and reptiles.
<b>Control Measures:</b>	<p><u>Mechanical:</u> Hand pulling: Can remove seedlings and young plants.</p> <p>Cutting: Cut to ground level in Spring before it flowers will reduce the number of seeds produced and will deplete the plants energy reserves.</p> <p><u>Biological (only in South Africa – beetles that have been successful biological agents since 1980):</u> <i>Trichapion lativentre</i>, a bud-feeding weevil that feeds on the leaflets as adults and develops within the flower buds as larvae; <i>Rhyssomatus marginatus</i>, a weevil whose larvae destroy the ripening seeds within the pods and whose adults feed on the leaves, flowers and meristems of the plants; and <i>Neodiplogrammus quadrivittatus</i>, a large stem-boring weevil whose larvae tunnel in the stems and branches causing structural damage, especially to vascular tissues, which eventually kills the plants.</p> <p><u>Chemical:</u> Triclopyr - Rate: Foliar treatment: 0.5% v/v solution of Garlon 4 Ultra to thoroughly wet all leaves. Cut stump treatment: 0.5 to 1.5% Garlon 4 Ultra v/v in water, or 3% Garlon 3A v/v in water. Pathfinder II is a ready to use formulation. Timing: Apply when plants are growing rapidly. Imazapyr - Rate: Cut stump treatment: 2% v/v solution of Habitat. Timing: Best when used in late summer to early fall, but before leaf drop.</p>
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required.
<b>Replacement Species:</b>	Dwarf coral tree ( <i>Erythrina humeana</i> ), September bush ( <i>Polygala myrtifolia</i> ), purple broom ( <i>Polygala virgata</i> ), wild pomegranate ( <i>Burchellia bubalina</i> )

**SILVER LEAF BITTER APPLE (*SOLANUM ELAEGNIFOLIUM*)**

<b>Category:</b>	NEMBA – Category 1b – Declared weed. Destroy.
<b>Description:</b>	General description: An herbaceous shrub growing up to 60cm high with felty leaves and stems. Leaves: Greyish or silvery-green leaves, often wavy and folded upwards along their midribs. Flowers: Mauve, blue or white flowers appear from October to March. Fruit/seeds: Shiny green berries with white patches, eventually turning yellow
<b>Origin &amp; Problem:</b>	North and South America. It forms dense spreading infestations which compete with crop plants. It is extremely difficult to eradicate as it has deep, spreading roots and the ability to regenerate from small root fragments. The plants are poisonous and unpalatable
<b>Form:</b>	Shrub
<b>Distribution:</b>	It is found in all provinces in South Africa
<b>Control Measures:</b>	<u>Mechanical:</u> <b>Seedlings &amp; saplings:</b> Hand pull. <b>All plants:</b> Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after treatment. Heavily infested areas should be revisited and treated if and as necessary every 6 months.
<b>Replacement Species:</b>	Indigenous, local grass species.

**SPEAR/SCOTCH THISTLE (*CIRSIUM VULGARE*)**

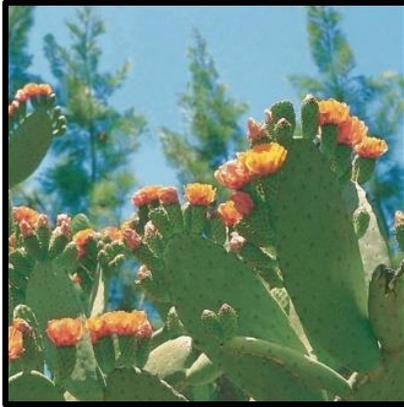
<b>Category:</b>	NEMBA – Category 1b – Declared weed. Destroy.
<b>Form:</b>	Herb
<b>General Description:</b>	Spiny, herbaceous biennial which forms a large, flat rosette of leaves and a deep tap root in the first year and numerous branched stems up to 1,5m high in the second year. Stems have spiny wings. Dark green leaves with stiff hairs above and white woolly beneath. Pink to mauve thistle-like flowers surrounded by spiny bracts appear from September to April.
<b>Origin &amp; Problem:</b>	Europe, Asia and North Africa. It causes heavy infestations that reduce the carrying capacity of the veld and can cause injury to man and animals. This plant invades grassland, roadsides, vlei and dam margins and river banks in cool, high rainfall areas.
<b>Distribution:</b>	Common throughout the Eastern Cape, KwaZulu-Natal, Gauteng, Mpumalanga, Limpopo and North West Provinces
<b>Control Measures:</b>	<u>Chemical:</u> Herbicides containing picloram are affective against seedlings. <u>Mechanical:</u> Physical removal of plants prior to seeding. Removal of seed heads prior to seeding.
<b>Monitoring Measures:</b>	Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation. Sites will need to be revisited monthly (more frequent if necessary) to cut back stems that are starting to flower and for any re-growth. With the removal of plants soils may become exposed and should be re-vegetated with grasses or indigenous species of the genera below.
<b>Replacement Species:</b>	<i>Ceratotheca triloba</i> <i>Vernonia sp.</i>

**SPINY COCKLEBUR (*XANTHIUM SPINOSUM*)**

<b>Category:</b>	NEMBA – Category 1b – Declared weed. Destroy.
<b>Description:</b>	A many branched annual growing up to 1,2m high. Yellowish or brownish-grey, downy stems. Green leaves which are densely white-woolly beneath and sparsely downy above. Each leaf base is armed with a yellow, three-pronged spine up to 2cm long. Pale yellowish burrs covered with spines.
<b>Form:</b>	Herbaceous shrub
<b>Origin &amp; Problem:</b>	South America. Competes with crop plants and indigenous species along riverbanks. Its spiny burrs adhere to the wool of sheep and become entwined in tails, manes and coats of domestic livestock, causing the animals much discomfort. The seedlings are particularly toxic to domestic livestock. It readily invades overgrazed pastures and spreads at the expense of the indigenous species.
<b>Distribution:</b>	Throughout all provinces in South Africa.
<b>Control Measures:</b>	<u>Mechanical:</u> Hand pull. Remove underground parts preferably when not seeding. Remove seed heads carefully and dispose of. <u>Chemical:</u> Susceptible to a range of soil and foliar herbicides available for agricultural markets.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after treatment. Heavily infested areas should be revisited and treated if and as necessary every 6 months.
<b>Replacement Species:</b>	Indigenous, local grass species.

**SPREADING CENTURY PLANT (*AGAVE AMERICANA*)**

<b>Category:</b>	Category 3 in Western Cape and Not listed elsewhere.
<b>General Description:</b>	Succulent shrub with a basal rosette of thick, heavy leaves up to 2 m high; suckers from the base; flowering pole 5-9 m tall. Leaves light grey, with toothed margins and terminal spine; leaves reflexed (as opposed to unreflexed in variety <i>expansa</i> ); variegated forms have grey to dark green leaves with yellow or white margins and a central stripe.
<b>Form:</b>	Shrub
<b>Distribution:</b>	Western Cape, Eastern Cape, KZN, Free State, Northern Cape, Limpopo, and Mpumalanga.
<b>Problem &amp; Origin:</b>	Mexico. The plant eventually forms dense almost impenetrable thickets and has properties that can cause injury to people and animals.
<b>Control Measures:</b>	<u>Mechanical:</u> Small infestations of <i>A. americana</i> can be controlled by digging out small plants manually. Large plants can be moved by machinery. Care should be taken to dig out the taproot to prevent spread by suckering, and all pieces need to be disposed of properly.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.

**SWEET PRICKLY PEAR (*OPUNTIA FISUS-INDICA*)**

<b>Category:</b>	NEMBA – Category 1b
<b>General Description:</b>	Succulent, branched shrub or tree up to 3m high which forms a sturdy trunk with age. Leaves: Minute leaves. Flowers: Bright yellow or orange showy flowers appearing from October to December. Fruit/seeds: Yellowish turning reddish edible fruit covered with minute spines.
<b>Form:</b>	Shrub
<b>Distribution:</b>	All provinces of South Africa
<b>Origin &amp; Problem:</b>	Central America (Mexico). Competes with and replaces indigenous species. Dense infestations reduce the grazing potential of the land and restrict access by domestic and wild animals. The spiny cladodes can cause injuries to animals and during the fruiting season the minute spines (glochids) on the fruits can be highly irritative and can result in animals being unable to feed. Dense infestations can cause drastic devaluation of agricultural and conservation land.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.
<b>Replacement Species:</b>	<i>Euphorbia</i> spp. and <i>Aloe</i> spp

**SYRINGA (MELIA AZEDARACH)**

<b>Category:</b>	NEMBA – Category 1b 3 in urban areas
<b>General Description:</b>	A large spreading tree growing up to 23m high with reddish-brown, smooth bark. Leaves: Serrated dark glossy green leaves which turn yellow in autumn. Flowers: Clustered purple to lilac flowers and heavily scented appearing from September-November. Fruit/Seeds: Green berries which turn yellow and wrinkled at the end of the season.
<b>Form:</b>	Tree
<b>Distribution:</b>	All provinces of South Africa
<b>Problem &amp; Origin:</b>	Asia to Australia; the form in southern Africa is an Indian cultivar. It competes with and replaces indigenous species. Indigenous birds could neglect the dispersal of indigenous plants as a consequence of their preference for the fruits of this alien species. The effective seed dispersal by water enables this species to invade protected areas far from the parent plant
<b>Control Measures:</b>	<u>Biological control:</u> Acacia seed weevils <u>Mechanical and Chemical:</u> Seedlings & Saplings: Hand pull or hoe. Foliar sprays: Garlon 480 EC or Viroaxe (25-50 ml/10l water) at 0.5 to 2 l/ha. Trees up to 1.5 m: Foliar sprays with Garlon 480 EC or Viroaxe (75 ml/10l water) at 3 l/ha. For mature trees: Cut stump and apply Timbrel 360 SL (300 ml/10l water) at 1.5 l/ha or Mamba 360 SL (200 ml/10l water) at 6 l/ha to freshly cut areas. Frill and apply Mamba 360 SL (2 l/10l water) at 6 l/ha.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.
<b>Replacement Species:</b>	Cape chestnut ( <i>Calodendrum capense</i> ), pompom tree ( <i>Dais cotinifolia</i> ), mountain seringa ( <i>Kirkia wilmsii</i> ), white seringa ( <i>Kirkia acuminata</i> ), lowveld chestnut ( <i>Sterculia murex</i> ), lavender tree ( <i>Heteropyxis natalensis</i> )

**TREE-OF-HELL (AILANTHUS ALTISSIMA)**

<b>Category:</b>	CARA 2002 – Category 3 NEMBA – Category 1b
<b>General Description:</b>	A fast growing tree from China which can grow to 20m or more. It has smooth stems with pale grey bark, and twigs which are light chestnut brown, especially in the dormant season. Bark: Grey, smooth or scaly bark. Leaves: Dark green leaves, with yellowish autumn tints that give off an unpleasant odour when crushed. Flowers: Greenish-yellow flowers, in large terminal sprays, from October to November. Fruit/seeds: Papery winged fruit, tan pink-coloured.
<b>Form:</b>	Tree
<b>Distribution:</b>	Western Cape, Eastern Cape, Free State, KZN, Mpumalanga and Gauteng.
<b>Problem &amp; Origin:</b>	China. Competes with and has the potential to replace indigenous species.
<b>Control Measures:</b>	<u>Mechanical:</u> Seedlings & saplings: Hand pull. All plants: Cut close to ground.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.
<b>Replacement Species:</b>	Wild plum ( <i>Harpephyllum caffrum</i> )

## WILD TOBACCO (NICOTIANA GLAUCA)



<b>Category:</b>	Category 1 NEMBA – Category 1b
<b>Form:</b>	Shrub
<b>Distribution:</b>	Throughout South Africa
<b>General Description:</b>	Evergreen shrub or small tree growing up to 6m high. Leaves: Blue-green, leathery leaves sometimes with purplish tints and smooth margins. Flowers: Yellow, tubular flowers in terminal, drooping clusters appear throughout the year. Fruit/seeds: Brown, four-valved fruit capsules with tiny seeds
<b>Origin &amp; Problem:</b>	South America. Competes with pioneering indigenous species. Can form dense and extensive stands along watercourses after flooding; this is of particular concern in conservation areas such as the Kruger National Park. Unpalatable and poisonous to domestic and wild animals.
<b>Control Measures:</b>	<p><u>Chemical:</u> Herbicides triclopyr and imazapyr.</p> <p><u>Mechanical:</u> Ring bark tall plants as close to the ground as possible. Pull out seedlings in the wet season when the soil is soft</p>
<b>Monitoring Measures:</b>	<p>Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation.</p> <p>Sites will need to be revisited monthly (more frequent if necessary) to cut back stems that are starting to flower and for any re-growth.</p> <p>With the removal of plants soils may become exposed and should be re-vegetated with grasses or indigenous.</p>
<b>Replacement Species:</b>	<i>N. james brittania</i> , <i>N. grandiflora</i>

**WHITE FLOWERED MEXICAN POPPY (*ARGEMONE OCHROLEUCA*)**

<b>Category:</b>	Category 1 NEMBA – Category 1b
<b>Form:</b>	Herb
<b>Distribution:</b>	Throughout South Africa
<b>General Description:</b>	A very spiny annual herb growing up to 90cm high with stems that exude a yellow sap when cut. Grey or bluish-green spiny leaves with prominent white veins. Pale yellow or creamy white flowers appear from September to January. Spiny, oblong green fruit capsules turn.
<b>Origin &amp; Problem:</b>	Mexico. Prolific in disturbed sites and competes with agricultural crops and indigenous species. This plant contaminates crop seed and the spiny fruits and leaf tips can adhere to the wool of sheep. The seeds and parts of the plant are poisonous to humans and livestock.
<b>Control Measures:</b>	<p><u>Biological control:</u> Various insect agents are being tested.</p> <p><u>Chemical:</u> Herbicides containing picloram are affective against seedlings.</p> <p><u>Mechanical:</u> Physical removal of plants prior to seeding. Removal of seed heads prior to seeding. Light tillage can destroy seedlings.</p>
<b>Monitoring Measures:</b>	<p>Photographic evidence should be kept and photographs taken on each site visit in areas of heavy infestation.</p> <p>Sites will need to be revisited monthly (more frequent if necessary) to cut back stems that are starting to flower and for any re-growth.</p> <p>With the removal of plants soils may become exposed and should be re-vegetated with grasses or indigenous.</p>
<b>Replacement Species:</b>	Indigenous grasses or herbs

**WHITE MULBERRY (*MORUS ALBA*)**

<b>Category:</b>	NEMBA – Category 3
<b>General Description:</b>	A deciduous tree growing up to 15m high with a round canopy and greyish branches. Leaves: Light green leaves with finely serrated margins which turn yellow in autumn. Flowers: Small greenish flowers forming in cylindrical spikes appearing in spring. Fruit/Seeds: Juicy bulbous reddish-black edible fruits.
<b>Form:</b>	Tree
<b>Distribution:</b>	Common throughout Gauteng, KwaZulu-Natal, Mpumalanga and Limpopo Provinces
<b>Origin &amp; Problem:</b>	Asia. May outcompete and displace other native plant plants in South Africa because of its high growth rate and great adaptability to adverse environments which allow it to establish and spread quickly
<b>Control Measures:</b>	<p><u>Biological control:</u></p> <p>Acacia seed weevils</p> <p><u>Mechanical and Chemical:</u></p> <p>Seedlings &amp; Saplings: Hand pull or hoe.</p> <p>Foliar sprays of Mamba 360 SL (150 ml/10l water) for saplings up to 1 m at 3 l/ha; Garlon 480 EC or Viroaxe (25-75 ml/10l water) for saplings up to 1.5 m at 0.5 to 1.5 l/ha; or Touchdown Forte for saplings up to 2 m at 3 l/ha.</p> <p>Young trees: Foliar sprays with Garlon 480 EC or Viroaxe (75 ml/10l water) at 3 l/ha.</p> <p>For mature plants: Cut or frill and apply Timbrel 360 SL (300 ml/10l water) at 1.5 l/ha to freshly cut areas.</p> <p>Cut and apply mycoherbicide (Stumpout<sup>®</sup>) to freshly cut stumps.</p> <p>Use triclopyr butoxyethyl ester (Garlon 480 EC or Viroaxe) in areas where grasses occur.</p>
<b>Monitoring Measures:</b>	<p>Photographic records should be kept of infested areas and should be taken at each visit.</p> <p>Re-growth should be monitored 2 and 4 months after chemical application and treated as required.</p> <p>Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.</p>
<b>Replacement Species:</b>	white mulberry ( <i>Morus alba pendula</i> ), Forest Fever-berry ( <i>Croton sylvaticus</i> ), Wild mulberry ( <i>Trimeria grandifolia</i> ), Cape Fig ( <i>Ficus sur</i> )

## YELLOW BELLS (*TECOMA STANS*)



<b>Category:</b>	NEMBA – Category 1b
<b>Description:</b>	Evergreen shrub or small tree growing up to 4m high. Leaves: Leaves are bright green above, paler below, with sharply toothed margins. Flowers: Bright yellow, showy, trumpet-shaped flowers in terminal sprays from October to May. Fruit/seeds: Brown, shiny fruit capsules 12-20cm long that split open to release papery winged seeds.
<b>Form:</b>	Tree
<b>Distribution:</b>	Eastern Cape, KwaZulu-Natal, Mpumalanga, Gauteng, Limpopo Provinces
<b>Origin &amp; Problem:</b>	Mexico and Texas, Arizona and New Mexico in the United States. Competes with and has the potential to replace indigenous species. Can invade hot and dry savanna where it may reduce grazing for domestic and wild animals.
<b>Control Measures:</b>	Mechanical removal is advised.
<b>Monitoring Measures:</b>	Photographic records should be kept of infested areas and should be taken at each visit. Re-growth should be monitored 2 and 4 months after chemical application and treated as required. Heavily infested areas should be revisited and treated if and as necessary at least every 6 months.
<b>Replacement Species:</b>	Cape honeysuckle ( <i>Tecoma capensis</i> ), yellow bauhinia ( <i>Bauhinia tomentosa</i> ), weeping wattle ( <i>Peltophorum africanum</i> ).