

**A MANAGEMENT PLAN  
FOR CYCADS IN KWAZULU-NATAL**

**THREATENED PLANT CONSERVATION UNIT  
BIODIVERSITY CONSERVATION ADVICE DIVISION, EZEMVELO KZN WILDLIFE**

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## TABLE OF CONTENTS

1	INTRODUCTION .....	4
1.1	Overview of cycad status and management issues in KwaZulu-Natal .....	4
1.2	Species subject to management .....	5
1.3	Supervisory authority.....	5
2	AIM AND OBJECTIVES FOR CYCAD MANAGEMENT IN KWAZULU-NATAL.....	5
3	LEGISLATION AND INTERNATIONAL CONVENTIONS .....	6
3.1	KwaZulu-Natal.....	6
3.2	National .....	6
3.3	International.....	6
4	KWAZULU-NATAL POLICY FOR CYCADS .....	7
4.1	Summary of cycad policy for KwaZulu-Natal .....	7
4.1.1	The sustainable use of cycads.....	7
4.1.2	Ex situ conservation .....	7
4.1.3	Population enhancement.....	7
4.1.4	Use and disposal of salvaged and confiscated material .....	7
4.1.5	Marking of cycads .....	8
5	REGULATIONS .....	8
6	COMPLIANCE .....	8
6.1	Law enforcement.....	8
6.2	Permits .....	8
6.3	Offences and penalties.....	9
6.4	Forfeitures .....	9
7	AGREEMENTS FOR MANAGEMENT OF WILD POPULATIONS .....	9
7.1	Ezemvelo KZN Wildlife protected areas.....	9
7.2	Private land and land under Tribal Authority .....	10
8	MANAGEMENT STRATEGIES FOR THREATENED POPULATIONS .....	10
8.1	In situ management.....	10
8.1.1	Colony protection .....	10
8.1.2	Habitat management .....	11
8.1.3	Habitat restoration .....	11
8.1.4	Population enhancement by reinforcement and reintroduction .....	11
8.2	Ex situ conservation .....	11
8.2.1	Seed orchards (live gene bank) .....	12
8.2.2	Off-site <i>ex situ</i> propagation .....	12
8.2.3	On-site <i>ex situ</i> propagation .....	12
8.3	Salvage operations.....	13
8.4	Harvesting .....	13
8.4.1	Commercial and non-commercial harvesting.....	13
8.4.2	Traditional harvesting .....	13
8.4.3	Non-commercial seed harvesting.....	13
8.4.4	Commercial seed harvesting.....	13
8.4.5	Whole plant and sucker harvesting.....	14

8.4.6	Harvesting returns .....	14
8.5	Population census .....	14
8.6	Research .....	14
8.7	Public education and awareness .....	14
9	DESCRIPTION AND STATUS OF CYCADS IN KWAZULU-NATAL.....	14
9.1	Species descriptions .....	14
9.1.1	<i>Encephalartos lebomboensis</i> Verdoorn, 1949 .....	15
9.1.2	<i>Encephalartos senticosus</i> Vorster, 1996 .....	15
9.1.3	<i>Encephalartos aemulans</i> Vorster, 1990 .....	15
9.1.4	<i>Encephalartos msinganus</i> Vorster, 1996 .....	16
9.1.5	<i>Encephalartos natalensis</i> Dyer & Verdoorn, 1951 .....	16
9.1.6	<i>Encephalartos caffer</i> (Thunberg, 1775) Lehmann, 1834 .....	17
9.1.7	<i>Encephalartos cerinus</i> Lavranos & Goode, 1989 .....	17
9.1.8	<i>Encephalartos ngoyanus</i> Verdoorn, 1949.....	17
9.1.9	<i>Encephalartos villosus</i> Lemaire, 1867 .....	18
9.1.10	<i>Encephalartos ferox</i> Bertoloni f., 1851 .....	18
9.1.11	<i>Encephalartos friderici-guilielmi</i> Lehmann, 1834 .....	18
9.1.12	<i>Encephalartos ghellinckii</i> Lemaire, 1867 .....	19
9.1.13	<i>Stangeria eriopus</i> (Kunze, 1839) Baillard, 1892 .....	19
10	GLOSSARY .....	21
11	ACRONYMS .....	21
12	BIBLIOGRAPHY .....	22
13	ACKNOWLEDGMENTS .....	22
14	APPENDIX 1. KWAZULU-NATAL POLICY FOR CYCADS .....	23
14.1	The sustainable use of cycads.....	23
14.1.1	Rationale .....	23
14.1.2	Policy statement .....	23
14.2	Ex situ conservation .....	23
14.2.1	Rationale .....	23
14.2.2	Policy statement .....	24
14.3	Population enhancement.....	24
14.3.1	Rationale .....	24
14.3.2	Policy statement .....	24
14.4	Use and disposal of salvaged and confiscated material.....	24
14.4.1	Rationale .....	24
14.4.2	Policy statement .....	25
14.5	Marking of cycads .....	25
14.5.1	Rationale .....	25
14.5.2	Policy statement .....	25

## INTRODUCTION

### 1.1 Overview of cycad status and management issues in KwaZulu-Natal

In KwaZulu-Natal, there are 13 species of the cycad genus *Encephalartos* and one species belonging to the monotypic genus *Stangeria*. The species display a variety of forms, from subterranean grassland species such as *S. eriopus* and *E. ngoyanus* to tall, erect species such as *E. natalensis* and *E. msinganus*. The habitat and distribution of KwaZulu-Natal cycads varies considerably: *S. eriopus* is located in coastal forests and grasslands, the larger *E. ferox* is common on grassy dunes of northern Maputaland, *E. natalensis* has an extensive distribution in KwaZulu-Natal and is most often located on steep, inaccessible cliff faces and *E. ghellinckii* is common in the grassland foothills of the Drakensberg but also extends southwards towards the Eastern Cape, where it is less common. *Encephalartos cerinus*, *E. aemulans* and *E. msinganus* have very localised distributions in northern KwaZulu-Natal.

Using abundance and distribution as criteria to define rarity, most cycads in KwaZulu-Natal are considered rare. In addition to these criteria, the World Conservation Union (IUCN) uses recorded population trends in abundance or distribution to assign a conservation status to their red list categories. Species facing an extremely high risk or a very high probability of extinction in the wild in the immediate future are referred to as Critically Endangered or Endangered, respectively. In KwaZulu-Natal, *Encephalartos cerinus* is Critically Endangered while *E. aemulans*, *E. msinganus* and *E. caffer* are Endangered. Vulnerable species (facing a high risk of extinction in the wild in the medium-term) are *E. friderici-guilielmi*, *E. ghellinckii*, *E. lebomboensis*, *E. ngoyanus* and *E. senticosus*. The Lower Risk category applies to species that, after evaluation, do not satisfy the criteria for the former groupings. *Encephalartos ferox*, *E. natalensis*, *E. villosus* and *Stangeria eriopus* are considered Lower Risk in KwaZulu-Natal. One species, *E. woodii*, is extinct in the wild.

Most cycad populations in KwaZulu-Natal are greatly fragmented. Fragmentation is a natural phenomenon when colonies are located on disjunct mountains. The distribution of *E. natalensis* in KwaZulu-Natal is a good example of a naturally fragmented species. Fragmentation is often a consequence of habitat modification for development or agriculture. The effective size of any cycad population is further reduced by biological limitations particular to cycads. Cycads are generally long-lived plants and may take more than a decade to become sexually mature. Mature plants may not necessarily cone each year. Being dioecious, there are separate male and female plants, often resulting in skewed sex ratios within any one population. Illegal harvesting that promotes the preferential harvesting of female plants because they are more appealing to commercial dealers exacerbates this phenomenon. Successful regeneration in cycads is often severely inhibited by land management practices. Where fire is used annually as a grassland management action, cycad seedlings may not regenerate successfully because of fire damage. The effective (sexually productive) size of fragmented cycad populations is therefore considerably smaller than the total number of plants recorded in any population. Most cycad species in KwaZulu-Natal are prone to a special set of circumstances that characterise small populations. Genetically, small populations suffer from bottlenecks and inbreeding depression. Limited genetic diversity renders a population susceptible to extinction because it is unable to adapt to changing conditions. Small populations are also vulnerable to loss of important pollinators and dispersal vectors. In the past, wind was thought to be responsible for cycad pollination. There is now good evidence that insects pollinate certain cycad species. Pollination biology is generally not well understood in cycads but if there are species-specific pollinators associated with certain cycad species, then they too will be at risk to the problems associated with small population size. Finally, small populations are susceptible to extinction through chance effects. Drought, disease or flooding can cause high mortality in any population and their impact on small populations can be catastrophic.

In spite of these natural phenomena, cycads in KwaZulu-Natal face their biggest threat from illegal harvesting. The smaller subterranean species such as *Encephalartos ngoyanus* and *Stangeria eriopus* are valued medicinal plants. They are easily accessible and, once located, harvesters will decimate a colony. The bark of larger cycad species such as *E. natalensis* also has medicinal value. Once bark has been removed from a stem the plant will die. Cycads have further cultural value to indigenous people and are frequently removed from the wild to be planted in the vicinity of houses for their magical properties. Undoubtedly the biggest threat to wild populations of all cycad species is the demand to satisfy the landscape gardener and the collector. Huge sums of money are involved in this illegal trade that services national and international markets. Well-informed networks coordinate the trade but it is usually poor tribal people from rural villages who take the risk of removing plants from the wild.

The continued illegal removal of cycads from the wild in KwaZulu-Natal and the lack of a formal conservation plan for cycads in the Province prompted the development of this document. The priority for cycad conservation in KwaZulu-Natal is security and effective management to ensure the long-term viability of cycad populations in the wild. Conservation efforts must be concentrated at the sub-population level. There is negligible gene flow between populations because of the highly fragmented distribution of cycads. This has resulted in genetic variation between populations and it is this variation that management actions must strive to conserve. Relatively few cycad colonies receive protection from formal conservation areas in KwaZulu-Natal and all Endangered or Critically Endangered cycad species are found outside protected areas. Managers of private and communal land, therefore, have a significant role to play in the conservation of cycads in KwaZulu-Natal. This document serves to inform the public on existing legislation and regulations controlling cycads. The variety of management options available to the landowner is also offered as a first step towards managing cycad colonies on their land. The document is aimed at all individuals and organisations interested in, and affected by, the use of cycads and their conservation.

## 1.2 Species subject to management

Division: Cycadophyta  
Order: Cycadales  
Family: Zamiaceae  
Genus/species: All species, subspecies and hybrids of the genus *Encephalartos* in KwaZulu-Natal.  
Zulu names: uThobani, isiDawu, uJubane, isiGqiki-semkhovu, isidwaba-somkhovu  
Family: Stangeriaceae  
Genus/species: *Stangeria eriopus*  
Zulu name: imfingo

This management document applies to wild cycad populations and to cycads belonging to private individuals including all plants propagated by artificial means.

## 1.3 Supervisory authority

The KwaZulu-Natal Nature Conservation Board is a semi-autonomous body that controls the affairs of nature conservation in KwaZulu-Natal and is answerable to the Provincial Minister of Agriculture and Environmental Affairs. The implementing authority is the KwaZulu-Natal Nature Conservation Service, which is known for marketing purposes as Ezemvelo KZN Wildlife. The KwaZulu-Natal Nature Conservation Board has CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) Management and Scientific Authority status which empowers the Board to administer and issue CITES permits and provide scientific advice on policy development.

Ezemvelo KZN Wildlife  
P.O. Box 13053  
Cascades 3202  
KwaZulu-Natal  
South Africa

Telephone: (27) (033) 845 1999  
Facsimile: (27) (033) 845 1000  
Web address: [www.rhino.org.za](http://www.rhino.org.za)

## 2 AIM AND OBJECTIVES FOR CYCAD MANAGEMENT IN KWAZULU-NATAL

The overall aim for cycad management in the Province is to maintain viable populations in the wild.

In order to achieve this, Ezemvelo KZN Wildlife will:

- protect wild populations of all cycad species,
- maintain the genetic diversity and genetic integrity of wild populations,
- manage wild cycad populations with specific emphasis on ensuring their long term viability,
- support the sustainable use of cycads, or cycad parts, for traditional purposes,
- promote the conservation of cycads through community participation,

- support the legal trade in cycads,
- support gene conservation projects with recognised botanical institutions whose policy regarding their conservation objectives is explicit,
- support and promote propagation programs to satisfy traditional markets, commercial trade and, where appropriate, facilitate re-introduction into the wild,
- promote, support and encourage public awareness and education on issues regarding cycad conservation and management,
- promote and support scientific research that contributes towards the conservation and long-term viability of wild populations of all cycad species,
- cooperate with other conservation agencies in South Africa in the protection and conservation of cycads.

### 3 LEGISLATION AND INTERNATIONAL CONVENTIONS

#### 3.1 KwaZulu-Natal

All *Encephalartos* species and *Stangeria eriopus* are protected indigenous plants in KwaZulu-Natal under sections 59 and 61 of the KwaZulu-Natal Nature Conservation Management Act 9 of 1997. *Encephalartos cerinus* is a specially protected indigenous plant in KwaZulu-Natal under sections 59 and 60. No person may gather, possess, export, import, introduce, purchase, sell, relocate or translocate a specially protected plant except under the authority of a permit issued by Ezemvelo KZN Wildlife. A permit, issued by Ezemvelo KZN Wildlife, is required to gather a protected plant from the wild or to transport, export and sell protected plants. Protected plants may only be purchased from a person who is legally entitled to do so. The conditions stipulated by the Act include all hybrids of *Encephalartos*. Specially protected and protected plants are listed under Schedules six and seven, respectively, of the Act.

#### 3.2 National

In terms of section 231 of the Constitution, it is the role of central government to administer international treaties. This has relevance to the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the United Nations Convention on Biological Diversity (Biodiversity Convention). The National Biodiversity Bill<sup>1</sup> serves to implement and enforce CITES in South Africa. All cycads in KwaZulu-Natal, including *Stangeria eriopus*, are listed under Appendix I of CITES and, as such, are protected under section 122 of the National Biodiversity Bill. *Stangeria eriopus*, a threatened species under section 97 (1) (d), is protected under section 98 of the National Biodiversity Bill. Sections 98 and 122 restrict all activities of listed plants in South Africa without a permit. 'Restricted activities' include gathering, collecting, picking, possessing, breeding, moving, importing, exporting, selling, trading, buying, receiving, giving, donating and accepting as a gift.

#### 3.3 International

All cycads in KwaZulu-Natal including *Stangeria eriopus* are listed under CITES Appendix I. CITES aims to regulate all trade in threatened and endangered species. CITES prohibits the possession and commercial trade in wild collected plants listed in Appendix I. The non-commercial trade (i.e. for scientific or conservation purposes) in Appendix I listed species is authorised under exceptional circumstances only. Artificially propagated plants of Appendix I species can be traded. All international transactions in Appendix I listed species require an export permit from the country of origin and an import permit from the recipient country. The import permit must be issued before the export permit is issued. In addition to the abovementioned CITES regulations, South Africa prohibits the trade in seeds (wild collected and artificially propagated) of Appendix I species.

South Africa is also a signatory to the Protocol on Wildlife Conservation and Law Enforcement in the Southern African Development Community, which prohibits the illegal trade in wildlife and wildlife products.

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<sup>1</sup> At the time of going to print, the National Biodiversity Act had not yet been enacted. The publication of the Cycad Management Plan for KwaZulu-Natal had already been delayed for some time pending the passing of the National Biodiversity Act and it was felt the document could not be stalled any longer.

## **4 KWAZULU-NATAL POLICY FOR CYCADS**

The KwaZulu-Natal policy for cycads provides guidance and a course of action for authorities and the general public regarding cycad related issues. A summary of the principal points is presented below; the complete policy for cycads in KwaZulu-Natal is available in Appendix 1.

### **4.1 Summary of cycad policy for KwaZulu-Natal**

#### **4.1.1 The sustainable use of cycads**

Mature cycad plants may not be harvested unless part of a salvage operation co-ordinated by Ezemvelo KZN Wildlife (see section 4.1.6). Cycad seed, seedlings and pollen may be harvested outside of Ezemvelo KZN Wildlife protected areas on a sustainable level provided the conservation targets set by Ezemvelo KZN Wildlife for a species have been achieved. Harvesting will only be permitted if planning is based on the long-term viability of the species in the wild and a detailed Management Plan indicating management actions for the particular colony is submitted. Harvesting of cycad seed or seedlings from within Ezemvelo KZN Wildlife protected areas will not be permitted unless the action is part of a Recovery Plan to maximise the rate at which conservation targets are met.

#### **4.1.2 Ex situ conservation**

*Ex situ* conservation relates to the conservation of genetic resources off-site, or outside their natural habitats. While *in situ* conservation is recognised by Ezemvelo KZN Wildlife to be the foundation of its strategy to conserve cycads in KwaZulu-Natal, *ex situ* conservation is considered essential to support, complement and enhance *in situ* management actions. Harvesting of cycad seed, seedlings and pollen will be permitted for *ex situ* conservation projects of recognised botanical institutions even if the conservation targets for a species have not been achieved. Confiscated or salvaged plants may be used for *ex situ* conservation purposes provided the provenance of the plants is known. It is the responsibility of Ezemvelo KZN Wildlife to co-ordinate *ex situ* conservation for threatened cycad species in the Province.

#### **4.1.3 Population enhancement**

Cycad colonies that are naturally small, or have become small through illegal harvesting, are prone to a special set of circumstances that characterise small populations. These problems include genetic effects (inbreeding depression, genetic bottlenecks), ecological effects (loss of specific pollinators and dispersal vectors) and chance events (drought, disease, flooding) that might destroy the whole colony. The long-term viability of cycad species may be addressed by: (1) adding individuals to an existing wild population (reinforcement), (2) re-establishing a cycad species to a site where it has become extinct (reintroduction) and (3) introducing a species to an area outside of its natural distribution. Enhancement programmes must take every precaution to prevent genetic and pathogenic contamination of existing wild populations. It is the responsibility of Ezemvelo KZN Wildlife to identify cycad populations requiring enhancement and implement enhancement programs where this will contribute to the long-term viability of the population.

#### **4.1.4 Use and disposal of salvaged and confiscated material**

Large areas of land in KwaZulu-Natal are cleared or modified for various reasons including the construction of roads, agriculture (including silviculture), water supply and urban development. Such transformation impacts directly on wild cycad population and any plants threatened by development must not be destroyed. Cycad populations threatened by land transformation are doomed, yet they represent a valuable resource that may be effectively used for conservation purposes. Members of the public who are aware of cycad populations threatened by development should contact Ezemvelo KZN Wildlife, who will co-ordinate the salvage and subsequent disposal of the cycads.

Material confiscated by law enforcement officers is forfeited to Ezemvelo KZN Wildlife. In most cases, the origin of the material is unknown and consequently it cannot be returned to the wild. Confiscated cycads are a valuable resource that can serve important conservation objectives. It is the responsibility of Ezemvelo KZN Wildlife to co-ordinate the disposal of confiscated cycads. The material may be used in *ex situ* conservation programs or for educational purposes. Surplus material will be sold to the general public by auction or tender.

#### **4.1.5 Marking of cycads**

To assist law enforcement officers in the policing of illegal cycad movement, all cycads with a stem diameter of 15 cm or greater, or 7 cm for the following species: *E. caffer*, *E. cerinus*, *E. cupidus*, *E. humilis*, *E. ngoyanus*, *E. umbeluziensis*, that are to be exported from KwaZulu-Natal must be marked with a unique microchip. The cost of the microchip will be borne by the party applying for the export permit. All cycads sold by auction or tender by Ezemvelo KZN Wildlife must be marked with a unique microchip.

## **5 REGULATIONS**

The following regulations control the trade and movement of cycads within KwaZulu-Natal and are enforced by Ezemvelo KZN Wildlife. Ezemvelo KZN Wildlife is responsible for issuing permits for all activities pertaining to cycads in KwaZulu-Natal.

1. A permit is required to export a cycad (or any part thereof, including seed) from KwaZulu-Natal. An officer of Ezemvelo KZN Wildlife must fit all cycads with a stem diameter of 15 cm or greater, or 7 cm for the following species: *E. caffer*, *E. cerinus*, *E. cupidus*, *E. humilis*, *E. ngoyanus*, *E. umbeluziensis*, with an identifying microchip transponder.
2. A permit is required to import cycads into KwaZulu-Natal.
3. Nurseries (or individuals) selling cycads must be registered with Ezemvelo KZN Wildlife and be issued with a licence.
4. A receipt of purchase must be issued with all cycads sold by registered traders.
5. A permit is required to transport a cycad in KwaZulu-Natal. All cycads transported within KwaZulu-Natal must have at least one full frond present for identification purposes.
6. Cycads (or any parts thereof, including seed) may only be donated under the authority of a permit issued by Ezemvelo KZN Wildlife. Persons receiving cycads by donation must insist on receiving a document that specifies the details of the transaction. The document must indicate the manner in which the donor came to possess the plants.

## **6 COMPLIANCE**

### **6.1 Law enforcement**

Members of the South African Police Services and Officers (including Honorary Officers) of Ezemvelo KZN Wildlife have the authority to enforce all sections of the abovementioned Provincial and National Acts.

Ezemvelo KZN Wildlife Officers (including Honorary Officers) may be issued weapons for the exercise of their duties and they may be designated with powers of arrest. An officer may arrest without a warrant. An officer may demand a permit, permission, authority from a person suspected of performing an act requiring such authority; demand the name and place of residence of a person suspected of committing an offence under the Act; seize and take possession of any article suspected of being used for the contravention of the Act; seize and take possession of a plant or hybrid (or any part thereof) in respect of which an offence under the Act has been suspected of having been committed. An officer may enter the land or premises without permission and without a search warrant to search, and take possession of, any article that is believed to provide evidence of an offence committed under the Act. If an officer is not wearing the uniform of Ezemvelo KZN Wildlife when exercising any authority under the Act, proof of appointment as an officer must be produced.

### **6.2 Permits**

Cycads receive protection under Provincial and National legislation. A permit, issued by Ezemvelo KZN Wildlife, is required for any restricted activity pertaining to cycads in KwaZulu-Natal and in South Africa as stipulated by the KwaZulu-Natal Nature Conservation Management Act 9 of 1997 and the Biodiversity Bill.

A permit is only valid for the purpose and the period for which it was issued and may not be transferred from the person to whom it was issued. Only the original permit constitutes proof of the issue of the permit and it will not be valid unless the official stamp of Ezemvelo KZN Wildlife is recorded and it bears the full name, physical

address and the signature of the person to whom the permit was issued. Any person claiming to operate under a permit issued by Ezemvelo KZN Wildlife must produce the permit on request of the police or Ezemvelo KZN Wildlife Officer and must produce proof of identity.

Permit applications are addressed to the local District Conservation Officer of Ezemvelo KZN Wildlife. It is the responsibility of the District Conservation Officer to investigate the application and recommend on the outcome of those investigations to the Ezemvelo KZN Wildlife Permits Office. The applicant is then informed of the outcome and the appropriate permit issued if successful.

### **6.3 Offences and penalties**

A person found guilty of contravention of the law with respect to specially protected and protected plants is liable to imprisonment for a period not exceeding 15 years or 10 years, respectively, or a fine, or imprisonment and a fine. A person who contravenes the regulations relevant to a permit commits an offence and is liable to imprisonment for a period not exceeding two years, a fine or both imprisonment and a fine. A person, who obstructs a member of Ezemvelo KZN Wildlife, fails to comply with a lawful demand made by an Ezemvelo KZN Wildlife officer or who gives false information in response to the demand is liable to imprisonment for a period not exceeding five years, a fine, or both imprisonment and a fine. All fines recovered in respect of offences under the Act will be payable to Ezemvelo KZN Wildlife.

### **6.4 Forfeitures**

A person convicted of an offence under the Act will forfeit the plant (or hybrid) involved in the offence to Ezemvelo KZN Wildlife. In addition, any vehicle (including aircraft) used while committing the offence may be forfeited to Ezemvelo KZN Wildlife on the first conviction, and will be forfeited for any subsequent convictions. The forfeitures will be in addition to any penalty imposed by the court.

## **7 AGREEMENTS FOR MANAGEMENT OF WILD POPULATIONS**

All cycad populations in KwaZulu-Natal are vulnerable to extinction and are protected by Provincial and National legislation and international agreements. Harvesting of wild cycad populations will only be considered in KwaZulu-Natal if the conservation targets for a species have been met or under exceptional circumstances, where there is a clearly demonstrated conservation outcome. Conservation targets are specific quantitative standards set to monitor the progress towards achieving conservation goals. A conservation target for a species would be the minimum number of free-living individuals required, that are capable of interbreeding, to maintain viable breeding populations in the long term. Simplistically, conservation targets seek to determine “how much is enough” to maintain regional biological diversity. Determining conservation targets is not a simple task and requires a detailed knowledge of the distribution and abundance of the target species. There has been a general reluctance to formalise conservation targets because they might unintentionally be interpreted as sanctioning further exploitation until the target is achieved or, alternatively, they might limit the options for further development if a rigid set of targets are accepted.

The development of conservation targets depends on whether information on biology (life history traits), distribution and abundance is available. Where abundance data are available, then the desired minimum population size is estimated. An area target is then based on habitat suitability for the species. Where abundance data are not available, expert biologists estimate a minimum area in which the cycad population will remain viable. The lack of biological understanding and relatively scarce records of distribution and abundance complicate setting conservation targets for cycads in KwaZulu-Natal. Most cycad species in the province have a highly fragmented distribution. Sub-populations appear to be reproductively isolated (no gene flow between them) which has caused some degree of genetic novelty. Management actions should therefore strive to conserve this intra-population genetic variation. This reasoning has guided the derivation of conservation targets for cycads in KwaZulu-Natal.

### **7.1 Ezemvelo KZN Wildlife protected areas**

Eight species of cycad (*Encephalartos senticosus*, *E. natalensis*, *E. caffer*, *E. ngoyanus*, *E. villosus*, *E. ferox*, *E. ghellinckii*, *Stangeria eriopus*) are located in protected areas controlled by Ezemvelo KZN Wildlife. Appropriate management actions for cycads occurring within Ezemvelo KZN Wildlife protected areas are addressed in the relevant Management Plans for the protected area. All wildlife in protected areas is protected and it is an

offence to gather any indigenous plant within a protected area. Harvesting of cycads is not permitted in protected areas unless such removal is part of an approved management plan that contributes towards the conservation of that population.

## **7.2 Private land and land under Tribal Authority**

Landowners do not have the authority to harvest wild cycad plants located on their property. Permits to harvest cycad seed, seedlings and pollen will be issued by Ezemvelo KZN Wildlife provided the conservation targets for the species have been met or if there is a clearly demonstrated conservation outcome to harvesting.

Private landowners and Tribal Authorities are encouraged to protect and manage cycad populations located on their land. Ezemvelo KZN Wildlife offers a service to landowners on appropriate land management practices. Specific Ezemvelo KZN Wildlife Recovery Plans address the management of cycad populations threatened with extinction. Landowners can contribute to cycad conservation by registering their cycad sites as Natural Heritage Sites or Sites of Conservation Significance. Both initiatives reflect a commitment from the landowner to dedicate a site of natural value to nature conservation. The South African Natural Heritage Programme is an initiative of the Department of Environmental Affairs and Tourism in association with provincial and national conservation agencies. Nature conservation authorities in South Africa formed the Sites of Conservation Significance Programme because important sites of natural value were being excluded by the stringent selection criteria of the Natural Heritage Programme. On registration, each landowner receives management advice required for the maintenance or enhancement of the site. Landowners requiring additional information regarding Natural Heritage Sites or Sites of Conservation Significance should contact Ezemvelo KZN Wildlife at the address provided under section 1.3.

## **8 MANAGEMENT STRATEGIES FOR THREATENED POPULATIONS**

The objective of all management actions is to protect existing wild populations from further decline and to ensure their long-term viability. Population-specific strategies will be implemented depending on the threats causing population decline. Wild populations are most often threatened by illegal removal to satisfy horticultural or medicinal/cultural demands. In addition, management practices (or lack thereof) threaten wild populations by inhibiting seed germination and the establishment of young plants (e.g. fire, bush encroachment). Small population size, as a natural phenomenon or caused by illegal harvesting, can affect pollination and dispersal processes through loss of plant specific animal vectors. In KwaZulu-Natal, most cycad species are restricted to extremely remote rocky regions. Habitat destruction caused by agricultural land transformation threatens the grassland species only (*Encephalartos ngoyanus*, *Stangeria eriopus*).

Successful cycad conservation will be achieved by actions applied to wild populations (*in situ*) and off-site (*ex situ*) activities that safeguard the genetic diversity of cycads away from their natural habitat. The recommended management strategies that follow will be applied to priority cycad populations to suit particular circumstances. Each management strategy must be planned in association with a monitoring plan that assesses, and reports on, the effect of the strategy measured against predetermined management objectives. In most cases, each strategy should form part of an official Recovery Plan that will ensure a high level of co-ordination and sustainability.

### **8.1 In situ management**

Landowners with cycads distributed on their property are encouraged to contribute towards cycad conservation by becoming involved in cycad management activities. Members of the public requiring management advice should direct queries to their local District Conservation Officer through the address provided under section 1.3.

#### **8.1.1 Colony protection**

Population security is critical where the major threat is illegal removal. Inaccessibility has saved many cycad colonies from extinction. Remote and rocky habitats, however, do not guarantee the security of sought after cycad species. While under no legal obligation, landowners and land managers must control access to land on which cycads are distributed.

### **8.1.2 Habitat management**

There are few management actions for cycad colonies located in precipitous habitats. The inaccessibility of these sites has, in many instances, saved cycad populations from local extinction. These sites should, however, be monitored for invasive alien vegetation which can threaten cycad recruitment (see 8.1.3 below). In KwaZulu-Natal, management actions available to land managers apply specifically to the grassland cycad species (*Encephalartos ngoyanus*, *E. ghellinckii*, *E. caffer*, *E. friderici-guilielmi*, *Stangeria eriopus*). Fire is an important tool used by land managers to promote grassland productivity for grazing and to reduce the threat of wildfire damage. Burning frequency influences aspects of cycad reproduction and recruitment. Frequent burning (annual, biennial) tends to destroy all young seedlings unless seeds are dispersed to refuges, such as rocky sites, safe from fire. Cycad colonies located in fire exclusion areas display poor leafing and retarded coning frequencies resulting in very poor reproductive success. It is unknown whether the poor reproductive response is caused by the lack of fire or the competitive effect of grass on cycads. A burning frequency of five to seven years is recommended for grassland habitats supporting cycads. However, burning frequency will vary according to grazing intensity. Each colony should be assessed individually.

### **8.1.3 Habitat restoration**

Habitat alteration through bush encroachment and alien plant invasion is a potential threat to wild cycad populations. Shading may detrimentally alter coning frequencies and the altered environment may affect germination and the successful establishment of young plants. In addition, dense alien vegetation creates a severe fire threat to adult and young plants alike.

Where cycad colonies are threatened by invasive vegetation (alien or natural), vegetation rehabilitation programmes are recommended. Alien vegetation should be removed with adequate provision for follow-up treatments to control re-growth. Where chemicals are used to control alien vegetation, application must be selective so that non-target plants (e.g. cycads) are not damaged or destroyed.

### **8.1.4 Population enhancement by reinforcement and reintroduction**

Cycad colonies that are naturally small, or have become small through illegal harvesting, are prone to a special set of circumstances that characterise small populations. These problems include genetic effects (inbreeding depression, genetic bottlenecks), ecological effects (loss of specific pollinators and dispersal vectors) and are vulnerable to chance events (drought, disease, flooding) that might destroy the whole colony. Male plants can dominate very small colonies because female plants are often collected preferentially. In these cases, reproductive success is severely retarded.

Adding individuals to an existing wild population (reinforcement) aims to address the problems associated with small population size. Seed is removed from the source population, germinated on-site (as close to the parent population as practical) and reintroduced when plants are at least five years old. The survival of plants reintroduced to the wild is far greater than if the seed was left to germinate and establish naturally. Reintroduced plants must originate from the parent population and must have been grown in the vicinity of the colony. These restrictions reduce the probability of genetic and pathogenic contamination to the parent population.

Re-establishing a cycad species to a site where it has become extinct (reintroduction) is another action aimed towards population persistence. The genetic material used to re-establish the new colony is unlikely to come from the previously extinct colony. Consequently, plants grown from seed sourced from the nearest site of the same species should be used for re-establishment. Genetic material whose origin is unknown, or material that might contaminate adjacent colonies, may not be used for re-establishment. A third form of enhancement is when a species is introduced to an area outside of its natural distribution. Such programmes will only be considered by Ezemvelo KZN Wildlife under exceptional circumstances.

Enhancement programmes may not be initiated without the relevant authority by means of a permit issued by Ezemvelo KZN Wildlife. Ezemvelo KZN Wildlife officials will assess each potential enhancement programme and provide appropriate guidelines once applications have been approved.

## **8.2 Ex situ conservation**

Where cycad populations are at a high risk of extinction in the wild, *ex situ* collections are essential for preserving representative genetic material from wild populations. Only recognised botanical institutions may house off-site collections and all plants within those collections must be of known genetic provenance. Off-site

collections provide material of known genetic origin for research, provide plants for educational purposes and serve as source material for breeding programmes to supply commercial, horticultural and cultural demand and therefore contribute towards reducing pressure on wild populations. Material from collections may also be used in enhancement programmes provided wild populations are not compromised by genetic or pathogenic contamination.

Unless there are exceptional circumstances (e.g. plants made available by salvage operations), established plants may not be removed from wild populations to establish any form of *ex situ* collection. Suckers may be removed for the purpose of establishing formal *ex situ* collections provided the appropriate permits are issued by Ezemvelo KZN Wildlife. It is important to ensure that sucker removal does not damage the parent plant and the wound is sealed with a fungicidal paste for protection. Seeds may be harvested to establish *ex situ* collections, provided removal is sustainable and the necessary permit granting authority has been received from Ezemvelo KZN Wildlife.

### **8.2.1 Seed orchards (live gene bank)**

At present, there are no reliable methods for the long-term storage of cycad seeds. Representative genetic material of wild populations may only be stored by establishing collections of living plants. Collections must be well documented with the precise locality of each individual plant recorded. When developing collections, it is important that the gene pool of the wild population is well represented. To achieve this, seed should be harvested from plants dispersed widely in the parent population. It is recommended that a minimum of five seeds from at least five widely dispersed mother plants be harvested to adequately represent the genetic diversity of a cycad population.

### **8.2.2 Off-site *ex situ* propagation**

The commercial propagation and export of cycads is a multi-million dollar industry. Aside from the landscaper who requires large plants and the serious collector who desires plants from specific localities, large-scale commercial cycad production can meet most of the demand for cycads. Fertile seeds of *Encephalartos* and *Stangeria* germinate readily and, under controlled conditions, success is usually high.

Cycads harvested illegally and confiscated by Ezemvelo KZN Wildlife are housed in dedicated Recovery Sites where they are then used in mass propagation programmes. In most cases, the origin of confiscated material is unknown. The genetic integrity of such material cannot be guaranteed and therefore cannot be used for the enhancement of wild populations. The material also has less value to the serious collector who often requires plants of known provenance. The aim of the breeding programmes at the Ezemvelo KZN Wildlife Recovery Sites is to generate high numbers of plants to satisfy cultural and medicinal demands.

### **8.2.3 On-site *ex situ* propagation**

Strict conditions apply to any *ex situ* propagation programme intending to reintroduce young plants to wild populations. To avoid genetic and pathogenic contamination of wild cycad populations, seeds harvested from wild populations should be germinated on-site (as close to the parent population as practical). Seedlings require at least a five-year hardening period before they are planted back into the habitat. Enhancement programmes, therefore, require a commitment from the landowner to harvest seeds sustainably, to successfully germinate the seeds, to manage the seedlings and finally to reintroduce the young plants back into the wild. Landowners intending to enter into such programmes must have adequate infrastructure that affords a secure and controlled environment for growth and development. Specific pathogen decontamination procedures must be followed before planting young individuals back into the source habitat. Special precautions must be taken by the landowner to ensure that pollen from garden cycad collections is not dispersed to the wild population during the reintroduction process. All enhancement programmes must be part of an official Recovery Plan co-ordinated by Ezemvelo KZN Wildlife.

Seedlings propagated from such on-site breeding programmes may be sold to the general public. The number of seedlings allocated for commercial sale must be predetermined and specified in the Recovery Plan. Conditions of the harvest permit will specify the proportion of harvested seed that must be used for the enhancement programme. Plants of known provenance are valuable to the cycad collecting community and sale of these plants will provide controlled access to potentially rare species.

### **8.3 Salvage operations**

Cycads at risk of being destroyed by legitimate activities such as road construction or agricultural development will be harvested for conservation purposes. Member of the public aware of cycads threatened by land transformation should contact Ezemvelo KZN Wildlife at the address provided under section 1.3. Ezemvelo KZN Wildlife will then inspect the site and be responsible for co-ordinating the salvage and subsequent disposal of the cycads. Salvaged material will be used to enhance or establish wild populations in protected areas provided the habitat is suitable and provided existing cycads in the establishment area are not compromised by genetic or pathogenic contamination. Alternatively, salvaged material will be made available to recognised institutions for *ex situ* conservation projects or for educational purposes. Failing these options, cycads may be disposed of to the general public by auction or tender. Salvaged cycads sold to the general public must be fitted with an identifying microchip transponder, the cost of which will be borne by the buyer.

### **8.4 Harvesting**

The goal of sustainable harvesting of cycads is the long-term conservation of wild populations and their habitats. Management on private land that provides for a direct commercial gain by landowners will contribute towards achieving this objective. The sustainable use of wild cycads benefits cycad conservation by making material of known provenance available to commercial markets and therefore reduces the need to collect from the wild.

#### **8.4.1 Commercial and non-commercial harvesting**

No person may gather a specially protected or protected plant, or parts thereof, growing in the wild except under the authority of a permit issued by Ezemvelo KZN Wildlife (sections 59 and 61 of the KwaZulu-Natal Nature Conservation Management Act 9 of 1997). Ezemvelo KZN Wildlife will consider applications for the sustainable harvesting of seedlings and pollen from private and communal land for commercial purposes provided the conservation targets (see section 7) for the species have been achieved. A management plan must be submitted to Ezemvelo KZN Wildlife with all applications to harvest cycads. The management plan should include a detailed map of the proposed harvest area, a demographic description of the cycad colony, specific land management actions of the habitat and details regarding the disposal of the harvested material. The management plan must state explicitly the positive conservation outcome to the wild population from sustainable harvesting.

#### **8.4.2 Traditional harvesting**

Under the KwaZulu-Natal Nature Conservation Management Act 9 of 1997 (section 64), traditional healers are considered separately from the general public regarding the harvest of specially protected and protected plants. Traditional healers do not, however, receive any special allowances to harvest indigenous plants in the Province and must follow the same permit application procedures as the general public. Traditional healers may only gather or possess a specially protected or protected indigenous plant if in possession of the relevant permit issued by Ezemvelo KZN Wildlife.

#### **8.4.3 Non-commercial seed harvesting**

Sustainable harvest of seed from data deficient or threatened cycad taxa will only be considered where a positive conservation outcome is likely from the harvest. Such circumstances include the use of the seed to establish *ex situ* populations at registered botanical institutions, scientific or educational purposes, and management of wild populations where limited harvesting of selected populations will enhance the long-term viability of the species. Harvesting prescriptions for threatened cycad taxa will be set on a case-by-case basis.

#### **8.4.4 Commercial seed harvesting**

Commercial harvest of seed will be limited to certain cycad sub-populations only. Seed may not be removed from all reproductive plants in the area. Ezemvelo KZN Wildlife will determine harvesting rates on a population specific basis. Limits will be placed on the number of reproductive females that may be harvested in any one year, and on the number of seeds removed from the prescribed harvest area. Conditions of the seed collection permit will specify the amount of seed landowners may harvest and whether harvesting may take place every year or in alternate years.

#### 8.4.5 Whole plant and sucker harvesting

No adult cycads (i.e. those with a stem diameter of 150 mm or greater, or 70 mm for *E. cerinus*, *E. caffer* and *E. ngoyanus*) or suckers may be harvested in KwaZulu-Natal unless part of an Ezemvelo KZN Wildlife co-ordinated salvage operation.

#### 8.4.6 Harvesting returns

Returns providing details of harvested material are a condition of all permits issued for the harvesting of cycads. Returns will be submitted at the end of the harvest season. Information from harvesting returns will be summarised in an annual report detailing the extent of cycad harvesting in KwaZulu-Natal.

### 8.5 Population census

Assessing the conservation status of a species requires detailed knowledge of the distribution and abundance of the species. Monitoring changes in the distribution and abundance of a species provides a basis for reviewing the levels of threat of extinction. Trends in distribution and abundance determine whether a species requires special management actions to ensure the long-term viability of populations in the wild. It is the responsibility of Ezemvelo KZN Wildlife to map and enumerate the distribution of cycad populations in KwaZulu-Natal and to monitor change in these populations.

### 8.6 Research

Research will focus on issues related to the adaptive management of cycad populations in the wild and the development of population viability models. Research will be encouraged on the following topics:

- determination of targets,
- pollination studies,
- seed dispersal studies,
- germination and recruitment studies,
- disturbance and perturbation studies (fire and harvesting),
- growth rate studies.

Parties interested in contributing towards or undertaking cycad research should contact the Head Biodiversity at the address provided under section 1.3 of this document.

### 8.7 Public education and awareness

The biology, ecological significance and economic value of cycads will be promoted in a variety of media and landowner extension activities conducted by Ezemvelo KZN Wildlife. The Crocodile Centre at St Lucia maintains a cycad collection for educational purposes.

## 9 DESCRIPTION AND STATUS OF CYCADS IN KWAZULU-NATAL

### 9.1 Species descriptions

Species belonging to what is referred to as the *Encephalartos lebomboensis* complex might cause some confusion regarding their identification and distribution. Recent detailed taxonomic research has revealed that the northern (Kangwane, Mpumalanga) and southern (Pongola River valley) extremes of *E. lebomboensis* differ from the plants located in the Lebombo Mountains in the vicinity of the Pongola Dam (Vorster, 1995). On the basis of cone morphology, the northern and southern populations have retained the name *E. lebomboensis*, while the main population located in the Lebombo Mountains of north-eastern KwaZulu-Natal and Swaziland has been assigned to a new species, *E. senticosus* (Vorster, 1996a). Two additional species, *E. aemulans* and *E. msinganus*, have recently been described from very localised sites in the northern KwaZulu-Natal region. Both species belong to the *E. lebomboensis* complex and can only be confidently separated from the rest of the group by characteristics of the male and female cones (Vorster 1990, 1996b). The cone morphology of *E. aemulans* and *E. msinganus*, however, can be easily confused with that of *E. natalensis*.

Mr. J. Hurter (National Botanical Institute) kindly made his unpublished lecture notes available for the species descriptions. The descriptions were further enhanced by consulting Giddy (1984), Goode (1989), Pooley (1993), Pooley (1998) and Scott-Shaw (1999).

### 9.1.1 *Encephalartos lebomboensis* Verdoorn, 1949

Retief cycad, Piet Retief cycad.

Part of the *E. lebomboensis* complex; vegetatively very similar in appearance to *E. aemulans*, *E. msinganus* and *E. senticosus*.

**Conservation status:** VULNERABLE

**Threats:** Illegal harvesting, particularly for commercial markets.

**Stem:** Erect, often leaning, up to 4 m tall, produces suckers from base and may have up to 8 stems on a plant, woolly crown.

**Leaves:** Bright green, up to 1.5 m long, arched, clear petiole (leaflet prickles do not extend to the leaf base). Leaflets more than 12 mm but less than 25 mm wide, closely spaced and overlapping, bent slightly inward, with 2 – 4 teeth on upper and lower margins.

**Cones:** Male and female cones solitary, sessile. Female cones barrel-shaped, yellow-green.

**Seeds:** Bright red.

**Habitat:** Cliffs, rocky ravines, savanna.

**Distribution:** KwaZulu-Natal near-endemic (includes Swaziland). Localised distribution in northern KwaZulu-Natal.

**Protection:** Not protected in formal conservation areas.

**Management guidelines:** Secure habitat from theft.

### 9.1.2 *Encephalartos senticosus* Vorster, 1996

Lebombo cycad, uJubane (Z).

Previously included in *Encephalartos lebomboensis*. Part of the *E. lebomboensis* complex; vegetatively very similar in appearance to *E. aemulans*, *E. lebomboensis* and *E. msinganus*.

**Conservation status:** VULNERABLE

**Threats:** Illegal harvesting, particularly for commercial markets.

**Stem:** Erect, often leaning, up to 4 m tall, produces suckers from base and may have up to 8 stems on a plant, woolly crown. Mixed small and large leafbase scars reflecting alternating wet and dry seasons.

**Leaves:** Bright green, up to 1.5 m long, arched, petiole clear (leaflet prickles do not extend to the leaf base). Leaflets more than 12 mm but less than 25 mm wide, closely spaced and overlapping, bent slightly inward, with 2 – 4 teeth on upper and lower margins.

**Cones:** Male cones orange to orange-yellow with a woolly covering, up to four on a stem. Female cones pale apricot yellow with a woolly covering, up to three on a stem. Very similar to *E. lebomboensis* but male cones are clearly stalked and have 3 – 4 on a stem (*E. lebomboensis*: male cones solitary and sessile).

**Seeds:** Bright red.

**Habitat:** Cliffs, steep-sided valleys, grassland.

**Distribution:** Maputaland endemic (includes Swaziland). Lebombo Mountains.

**Protection:** Protected in Maputaland reserves.

**Management guidelines:** Secure habitat from theft.

### 9.1.3 *Encephalartos aemulans* Vorster, 1990

Wolkop cycad.

Part of the *E. lebomboensis* complex; vegetatively very similar in appearance to *E. msinganus*, *E. lebomboensis* and *E. senticosus*. The female cones resemble those of *E. altensteinii* and *E. natalensis*.

**Conservation status:** ENDANGERED

**Threats:** Periodic fire damage, illegal harvesting.

**Stem:** Erect, rarely 3 m tall, dense woolly crown.

**Leaves:** Dark glossy green, up to 1.5 m long, straight with a clear petiole. Leaflets directed at an angle towards leaf apex, not overlapping, leaflet margins curved back in the direction of the underside of the leaf, with 2 – 3 teeth on upper and lower margins.

**Cones:** Male and female cones are very similar in size and appearance, sessile, 2 – 4 per stem. Male and female cones lemon-yellow and green, respectively, but both obscured by brown wool. Without cones the species is indistinguishable from *E. natalensis*; similar densely woolly male and female cones and sessile male cones are diagnostic.

**Seeds:** Bright red.

**Habitat:** Cliffs, steep slopes.

**Distribution:** KwaZulu-Natal endemic. Localised distribution in northern KwaZulu-Natal.

**Protection:** Not protected in formal conservation areas.

**Management guidelines:** Secure habitat from theft.

#### 9.1.4 *Encephalartos msinganus* Vorster, 1996

Msinga cycad.

Part of the *E. lebomboensis* complex; vegetatively very similar in appearance to *E. aemulans*, *E. lebomboensis* and *E. senticosus*. The male cones resemble those of *E. altensteinii*, *E. natalensis* and *E. senticosus*.

**Conservation status:** ENDANGERED

**Threats:** Illegal harvesting, particularly for commercial markets.

**Stem:** Up to 3 m tall, erect but often leaning, crown covered in dense brown wool.

**Leaves:** Glossy dark green, 1.5 m long, straight, clear unarmed petiole. Leaflets narrow (less than 12 mm wide), sharply bent inward, overlapping or not, entire or with teeth on upper and lower margins.

**Cones:** Male cones are on stalks, pale-yellow and 2 – 4 per stem. Female cones are sessile, up to two per stem and are greenish-yellow turning brighter yellow although the colour is obscured by brown wool. Female cones very similar to *E. natalensis* but have a warty appearance.

**Seeds:** Bright red.

**Habitat:** Cliffs, steep north facing slopes, grassland.

**Distribution:** KwaZulu-Natal endemic.

**Protection:** Not protected in formal conservation areas.

**Management guidelines:** Secure habitat from theft.

#### 9.1.5 *Encephalartos natalensis* Dyer & Verdoorn, 1951

Natal cycad, Natal giant cycad, isiGqiki-semkhovu (Z).

**Conservation status:** LOWER RISK

**Threats:** Illegal bark harvesting for medicinal purposes, illegal harvesting for commercial markets.

**Stem:** Up to 6 m tall, branching sometimes, usually erect but procumbent when other stems emerge from the same base.

**Leaves:** Shiny dark green, up to 3 m long. Leaflets greater than 25 mm wide, concave in cross-section, margins entire or with 1 – 4 teeth on upper and lower margins, has prickles towards the base of the leaf-stalk.

**Cones:** Golden-yellow, up to five on a crown. Young male and female cones woolly, but losing the wool with age.

**Seeds:** Bright orange-red.

**Habitat:** Cliffs, steep-sided valleys.

**Distribution:** KwaZulu-Natal near-endemic (includes Eastern Cape). Extensive distribution in the inland areas of KwaZulu-Natal from the Eastern Cape to Maputaland.

**Protection:** Protected in southern and central KwaZulu-Natal reserves.

**Management guidelines:** Secure habitat from bark harvesting and theft.

#### 9.1.6 *Encephalartos caffer* (Thunberg, 1775) Lehmann, 1834

Eastern Cape dwarf cycad, Eastern dwarf cycad.

**Conservation status:** ENDANGERED

**Threats:** Illegal harvesting for commercial markets, high burning frequency of grassland habitat kills seedlings.

**Stem:** Subterranean, with a heavy tuberous root system, usually single-stemmed.

**Leaves:** Up to 1 m long, light green, new growth very woolly, leafstalk straight, curved or twisted. Petiole is apparent. Leaflet lorate and parallel for most of its length, usually entire but juvenile plants may carry teeth on the upper and lower margins. Leaflets in different planes and twisted 90° to face the leaf tip, densely packed.

**Cones:** Single cone produced, green-yellow at maturity.

**Seeds:** Glossy bright red.

**Habitat:** Coastal grassland, rock outcrops.

**Distribution:** Mostly an Eastern Cape distribution but a disjunct population in southern KwaZulu-Natal.

**Protection:** Protected in southern KwaZulu-Natal reserves.

**Management guidelines:** Secure habitat from theft, a fire management burning frequency of 5 – 7 years is recommended.

#### 9.1.7 *Encephalartos cerinus* Lavranos & Goode, 1989

Waxen cycad.

**Conservation status:** CRITICALLY ENDANGERED

**Threats:** Illegal harvesting for commercial markets.

**Stem:** Subterranean but partially exposed when growing on rock. Usually single stemmed but does produce suckers.

**Leaves:** Up to 1.2 m long, dark blue-green with a waxy coating (smell by rubbing leaf). Petiole apparent (reduced leaflets do not extend to leaf base). Leaflet lorate and parallel for most of its length, set in one plane, sometimes slightly overlapping.

**Cones:** Single cone per crown, blue-green with a thick waxy coating turning yellow-orange at maturity.

**Seeds:** Yellow at first, ripening to deep pink to red.

**Habitat:** Sheer cliffs, rocky valley bushveld.

**Distribution:** KwaZulu-Natal endemic.

**Protection:** Not protected in formal conservation areas.

**Management guidelines:** Secure habitat from theft.

#### 9.1.8 *Encephalartos ngoyanus* Verdoorn, 1949

Ngoye dwarf cycad.

**Conservation status:** VULNERABLE

**Threats:** Agricultural development, high burning frequency of grassland habitat kills seedlings, illegal harvesting for medicinal purposes and commercial markets.

**Stem:** Underground stem with tuberous roots. Stem is occasionally branched.

**Leaves:** Dark green, up to 1.25 m long, erect and spreading. Leaflet lorate and parallel for most of its length, not twisted, have hairy margins and with one or more teeth on lower margin but are frequently entire.

**Cones:** Dark yellow (light green when young). Occur singly.

**Seeds:** Shiny red.

**Habitat:** Grassland, forest margins, rock outcrops.

**Distribution:** KwaZulu-Natal and Maputaland endemic (includes Swaziland). Lebombo Mountains of KwaZulu-Natal, Ngoye Forest in Zululand.

**Protection:** Protected in Zululand and Maputaland reserves.

**Management guidelines:** Secure habitat from theft, a fire management burning frequency of 5 – 7 years is recommended.

#### 9.1.9 *Encephalartos villosus* Lemaire, 1867

Poor man's cycad, isidwaba-somkhovu (Z).

**Conservation status:** LOWER RISK

**Threats:** Illegal harvesting for commercial markets.

**Stem:** Subterranean, usually unbranched.

**Leaves:** Shiny dark green, up to 2.5 m long, recurved, petiole not apparent (prickles extend to leaf base). Leaflet lorate and parallel for most of its length, flat in cross section, have 1 – 3 spiny teeth on upper and lower margins, veins not visible on upper surface.

**Cones:** Male cones are lemon yellow, female cones are yellowish orange. Up to four per crown.

**Seeds:** Shiny red.

**Habitat:** Coastal forest, scarp forest.

**Distribution:** Extensive but localised distribution from Eastern Cape, coastal southern KwaZulu-Natal, through central KwaZulu-Natal into Swaziland.

**Protection:** Protected in reserves throughout KwaZulu-Natal.

**Management guidelines:** Secure habitat from theft.

#### 9.1.10 *Encephalartos ferox* Bertoloni f., 1851

Zululand cycad, Tongaland cycad, Maputaland cycad, Kozi cycad.

**Conservation status:** LOWER RISK

**Threats:** Illegal harvesting for commercial markets, high burning frequency of grassland habitat kills seedlings.

**Stem:** Usually unbranched but occasionally branched from base, up to 1 m tall, 35 cm diameter.

**Leaves:** Dark-green, up to 2 m long. Leaflets twisted with more than five triangular lobed teeth, not markedly twisted out of the plane of the leaflet.

**Cones:** Both sexes have bright salmon-pink to orange-red or scarlet cones, females have 1 – 5 cones per crown, males have 1 – 6 cones per crown.

**Seeds:** Red to pale red to bright orange.

**Habitat:** Grassland on coastal dunes, coastal forest.

**Distribution:** Maputaland endemic (including Mozambique).

**Protection:** Protected in Maputaland reserves.

**Management guidelines:** Secure habitat from theft, a fire management burning frequency of 5 – 7 years is recommended.

#### 9.1.11 *Encephalartos friderici-guilielmi* Lehmann, 1834

White-haired cycad.

**Conservation status:** VULNERABLE

**Threats:** Illegal harvesting for commercial markets, high burning frequency of grassland habitat kills seedlings.

**Stem:** Up to 4 m long, erect or reclining, mature plants may have up to 6 stems. Crown is covered in loose brown wool.

**Leaves:** Over 1 m long, blue-grey, straight or gently curving, at an angle above the crown. Leaf bases covered by dense golden brown wool. Leaflets linear (equal breadth for most of their length), lack teeth but have a sharp point at the tip, often in different planes.

**Cones:** Males 3 – 6 (up to 12), females 3 – 5, covered with thick yellowish-grey to whitish wool.

**Seeds:** Pale yellow to yellow-orange.

**Habitat:** Montane grassland, rock outcrops.

**Distribution:** Disjunct population in KwaZulu-Natal.

**Protection:** Not protected in formal conservation areas.

**Management guidelines:** Secure habitat from theft, a fire management burning frequency of 5 – 7 years is recommended.

#### 9.1.12 *Encephalartos ghellinckii* Lemaire, 1867

Drakensberg cycad, isiDawu.

**Conservation status:** VULNERABLE

**Threats:** Illegal harvesting for commercial markets, high burning frequency of grassland habitat kills seedlings, low burning frequency appears to retard reproduction.

**Stem:** “Drakensberg” form may reach 3 m in length. Suckers from base, mature plant may have up to 3 stems. “Dwarf” form rarely longer than 1 m, usually reclining, mature plants may have up to 5 stems from the base. Open woolly crown.

**Leaves:** Leaves up to 1 m long, twisted, bright olive green, leafstalk bright yellow and twisted. New leaves greyish, covered in wool. Leaflets linear (equal breadth for most of their length) and entire, leaflet margins curved back in the direction of the underside of the leaf.

**Cones:** Densely woolly, pale yellow turning beige with age. Male and female plants produce up to 5 cones.

**Seeds:** Golden yellow.

**Habitat:** Mistbelt and montane grassland, rock outcrops.

**Distribution:** KwaZulu-Natal near-endemic (includes Eastern Cape).

**Protection:** Protected in the Drakensberg.

**Management guidelines:** Secure habitat from theft, a fire management burning frequency of 5 – 7 years is recommended.

#### 9.1.13 *Stangeria eriopus* (Kunze, 1839) Baillard, 1892

Natal grass cycad, imfingo (Z).

**Conservation status:** LOWER RISK

**Threats:** Agricultural development (including silviculture), illegal harvesting for medicinal purposes and commercial markets, high burning frequency of grassland habitat kills seedlings.

**Stem:** Entirely subterranean, branched or unbranched, supported by a large elongated tuberous root.

**Leaves:** Fern-like fronds, up to four leaves per stem, attached beneath the soil. Leaflets have a prominent midvein. Size variable according to habitat.

**Cones:** Male and female plants produce one cone per stem. Covered in silvery hairs, turning brown at maturity.

**Seeds:** Deep to pale pink, almost round.

**Habitat:** Coastal grassland, coastal forest, scarp forest.

**Distribution:** Extends from the Eastern Cape, through KwaZulu-Natal into Mozambique.

**Protection:** Protected in southern KwaZulu-Natal reserves and in Zululand.

**Management guidelines:** Secure habitat from theft, a fire management burning frequency of 5 – 7 years is recommended.

## 10 GLOSSARY

“communal land”: land under tribal authority.

“disjunct distribution”: location of a sub-population that is separate from the main range of the taxon.

“endemic”: restricted geographically to a single area.

“*ex situ*”: a place outside the natural habitat of a plant.

“export”: to transfer from a place in the Province to a place outside the Province

“lorate”: strap like, will twist around a finger.

“mature plant”: a plant with a stem diameter of 150 mm or more, or greater than 70 mm for the following species: *E. caffer*, *E. cerinus*, *E. cupidus*, *E. humilis*, *E. ngoyanus*, *E. umbeluziensis*.

“petiole”: stalk of a leaf.

“protected indigenous plant”: a plant, alive or dead, or part or produce of that plant, listed in the Seventh Schedule, KwaZulu-Natal Nature Conservation Management Amendment Act 5 of 1999.

“protected areas”: any area listed under section 19 or, declared or proclaimed under section 47, KwaZulu-Natal Nature Conservation Management Amendment Act 5 of 1999, or proclaimed in terms of national legislation and assigned to the province.

“provenance”: referring to a species distribution, specific location of populations in the wild.

“recovery plan”: a Management Plan developed for the conservation of species threatened with extinction.

“recovery site”: a safe area where material released by the Court are housed, usually for *ex situ* conservation purposes.

“restricted activity”: as defined in the National Biodiversity Bill, and meaning, amongst others, as gathering, collecting, picking, possessing, breeding, moving, importing, exporting, selling, trading, buying, receiving, giving, donating and accepting as a gift.

“seedling”: a plant with a stem diameter of less than 150 mm, or less than 70 mm for the following species: *E. caffer*, *E. cerinus*, *E. cupidus*, *E. humilis*, *E. ngoyanus*, *E. umbeluziensis*.

“sessile”: lacking a stalk.

“specially protected indigenous plant”: a plant, alive or dead, or part or produce of that plant, listed in the Sixth Schedule, KwaZulu-Natal Nature Conservation Management Amendment Act 5 of 1999.

“sucker”: a side growth which can produce a sister plant and is considered a separate plant when removed from the mother plant.

“silviculture”: referring to plantation forestry.

“traditional healer”: a traditional medicine man or woman who uses traditional medicines in effecting cures, including iZangoma, iziNyanga and abaThandazi.

## 11 ACRONYMS

CITES      Convention on International Trade in Endangered Species of Wild Fauna and Flora.

IUCN      World Conservation Union

## 12 BIBLIOGRAPHY

- Bürgener, M., Snyman, N. & Hauck, M. 2001. Towards a sustainable wildlife trade: an analysis of nature conservation legislation in South Africa with particular reference to the wildlife trade. Institute of Criminology, University of Cape Town, South Africa.
- Donaldson, J.S. In press. Regional overview: Africa. In: Donaldson, J.S. (editor). Cycad status, survey and action plan. IUCN, Gland, Switzerland.
- Giddy, C. 1984. Cycads of South Africa. C. Struik, Cape Town.
- Goode, D. 1993. Cycads of Africa. Struik Winchester, Cape Town.
- Goodman, P.S. 2003. Non Marine Biodiversity Conservation Targets for KwaZulu-Natal. Unpublished report, Biodiversity Division, Ezemvelo KZN Wildlife.
- Hemley, G. (Editor). 1994. International wildlife trade: a CITES sourcebook. World Wildlife Fund, Island Press, Washington, D.C.
- Pooley, E. 1993. The complete field guide to Trees of Natal, Zululand and Transkei. Natal Flora Publications Trust, Durban.
- Scott-Shaw, R. 1999. Rare and threatened plants of KwaZulu-Natal and neighbouring regions. KwaZulu-Natal Nature Conservation Service, Pietermaritzburg.
- Verdoorn, I. 1949. *Encephalartos lebomboensis*. Flowering plants of Africa 27: plates 1078-1079.
- Vorster, P. 1990. *Encephalartos aemulans* (Zamiaceae), a new species from northern Natal. South African Journal of Botany 56: 239-243.
- Vorster, P. 1995. The identity of *Encephalartos lebomboensis*. In: P. Vorster (editor), Proceedings of the Third International Conference on Cycad Biology. Cycad Society of South Africa, Stellenbosch, pages 245 – 254.
- Vorster, P. 1996a. *Encephalartos senticosus* (Zamiaceae): a new species from northern KwaZulu-Natal and Swaziland. South African Journal of Botany 62: 76-79.
- Vorster, P. 1996b. *Encephalartos msinganus* (Zamiaceae): a new species from KwaZulu-Natal. South African Journal of Botany 62: 67-70.
- Walters, T. In press. Off-site collections. In: Donaldson, J.S. (editor). Cycad status, survey and action plan. IUCN, Gland, Switzerland.

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## 14 APPENDIX 1. KWAZULU-NATAL POLICY FOR CYCADS

### KZN WILDLIFE POLICY FOR CYCADS

In KwaZulu-Natal there are 13 species of the cycad genus *Encephalartos* and one species belonging to the monotypic genus *Stangeria*. All cycads in KwaZulu-Natal are listed under CITES Appendix I. Cycad populations in KwaZulu-Natal have declined substantially due to land transformation for agricultural purposes and illegal harvesting.

The following policy for cycads in KwaZulu-Natal concerns cycad populations distributed in protected areas managed by Ezemvelo KZN Wildlife as well as cycad populations on private land, State land and land under Tribal Authority. It is recognised that cycads are best conserved in the wild and that the genetic integrity of wild cycad populations is a priority of all management activities. For the purposes of this policy, cycad seedlings are free-living plants with a stem diameter of less than 150 mm (*Encephalartos aemulans*, *E. msinganus*, *E. friderici-guilielmi*, *E. ghellinckii*, *E. lebomboensis*, *E. senticosus*, *E. ferox*, *E. natalensis*, *E. villosus*, *Stangeria eriopus*) or with a stem diameter of less than 70 mm (*E. cerinus*, *E. caffer*, *E. ngoyanus*).

#### 14.1 The sustainable use of cycads

##### 14.1.1 Rationale

There is a demand from a variety of users for cycads and cycad parts. Cycads of known genetic origin are particularly sought after by collectors. Cycads are known to produce enormous quantities of seed much of which germinates below the parent plants. Mortality amongst seed and seedlings is high resulting in wastage of a valuable resource.

Ezemvelo KZN Wildlife will consider applications for the harvesting of cycad seed, seedlings and pollen where it can be done on a sustainable basis and provided the conservation targets, determined by Ezemvelo KZN Wildlife, have been met (Principle 1). The option of sustainable harvesting offers financial incentive to landowners to protect and manage the cycad populations, and their habitats, on land outside of protected areas (Principle 2).

##### 14.1.2 Policy statement

1. No cycads, or any parts thereof, may be harvested within areas protected by Ezemvelo KZN Wildlife unless the action is part of a Recovery Plan to maximise the rate at which conservation targets are met.
2. No adult cycads (i.e. those with a stem diameter of 150 mm or greater, or 70 mm for *E. cerinus*, *E. caffer* and *E. ngoyanus*) may be harvested in KwaZulu-Natal unless part of an Ezemvelo KZN Wildlife co-ordinated salvage operation.
3. The sustainable harvesting of cycad seedlings, seed and pollen outside of Ezemvelo KZN Wildlife protected areas is permitted if the conservation targets for a particular species have been achieved. The Proposer, prior to submitting an application to Ezemvelo KZN Wildlife to harvest cycads (seedlings, seeds and pollen), is required to commission an independent study to assess the impact of the intended harvesting activities, and develop a management plan detailing the nature of the harvesting, and how the cycad colony and habitat will be managed.
4. Harvesting of cycad seedlings, seeds and pollen of a species whose conservation target has not been achieved is not permitted unless the action is part of a Recovery Plan to maximise the rate at which the conservation target for that species is met.

#### 14.2 Ex situ conservation

##### 14.2.1 Rationale

*Ex situ* conservation concerns the conservation of genetic resources off-site, or outside of their natural habitats. In contrast, *in situ* conservation refers to the conservation of biodiversity in the wild through the conservation, maintenance and recovery of viable populations of species in their natural surroundings.

*In situ* conservation is recognised by Ezemvelo KZN Wildlife to be the foundation of its strategy to conserve cycads in KwaZulu-Natal, but *ex situ* conservation, and the techniques and facilities used for *ex situ* conservation, are considered to be essential measures to support, complement and enhance *in situ* conservation (Principle 1).

#### 14.2.2 Policy statement

1. Harvesting of cycad seed, seedlings and pollen will be permitted for *ex situ* conservation projects of recognised botanical institutions even if the conservation targets for a species have not been achieved.
2. The use of adult cycads for *ex situ* conservation purposes will be permitted when made available by salvage operation or confiscation, provided the provenance of the adult plants is known.

#### 14.3 Population enhancement

##### 14.3.1 Rationale

Cycad colonies that are naturally small, or have become small through illegal harvesting, are prone to a special set of circumstances that characterise small populations. These problems include genetic effects (inbreeding depression, genetic bottlenecks), ecological effects (loss of specific pollinators and dispersal vectors) and chance events (drought, disease, flooding) that might destroy the whole colony. Male plants can dominate very small colonies because female plants are often collected preferentially. In these cases, reproductive success is severely retarded.

The long-term viability of cycad species may be addressed by: (1) adding individuals to an existing wild population (reinforcement), (2) re-establishing a cycad species to a site where it has become extinct (reintroduction) and (3) introducing a species to an area outside of its natural distribution (Principle 1).

##### 14.3.2 Policy statement

1. All intended enhancement programmes must take every precaution necessary to prevent genetic and pathogenic contamination of existing wild populations. Management actions to enhance wild populations must be documented in an Ezemvelo KZN Wildlife Recovery Plan prior to implementation.
2. Cycad populations at risk due to a lack of long-term demographic or genetic viability may be enhanced by:
  - (a) adding individuals to an existing wild population to address the problems associated with small population size;
  - (b) re-establishing extinct cycad colonies within the natural range of the species within or outside of protected areas where this will significantly increase the long-term viability of the species;
  - (c) introducing Critically Endangered and Endangered species to protected areas outside of their natural range should there be no appropriate areas elsewhere and such introduction is critical for survival of the species as indicated in an approved Recovery Plan.

#### 14.4 Use and disposal of salvaged and confiscated material

##### 14.4.1 Rationale

Large areas of land in KwaZulu-Natal are either cleared or modified for various reasons including the construction of roads, agriculture (including silviculture), water supply and urban development. Such transformation impacts directly on wild populations of cycads. Plants threatened by development should not be destroyed (Principle 1). The threatened populations of cycads of known location are essentially "doomed" yet represent a valuable resource that may be used effectively for conservation purposes (Principle 2).

Illegally gained cycads or cycad parts intercepted by law enforcement officers is confiscated and used as evidence in criminal proceedings. Once released by the court, the material is forfeited to Ezemvelo KZN Wildlife (this may occur prior to trial date). In most cases, the origin of the material is unknown and consequently it cannot be returned to the wild. Confiscated cycads are a valuable resource that can serve important conservation objectives (Principle 1). Historically, confiscated cycads have been used to landscape gardens in protected areas. In many cases, cycads planted in gardens threaten the genetic integrity of *in situ* cycad populations. Collectively, these plants represent a valuable resource that should be used in a manner that is in the best long-term interest of the species.

The critical distinction between salvaged and confiscated material is that the provenance of the latter is usually not known. Without this information, confiscated material may not be used for enhancement or *ex situ* conservation projects because of the risk of genetic and pathogenic contamination to wild populations. Ezemvelo KZN Wildlife is responsible for co-ordinating the salvage and subsequent disposal of cycads threatened by land transformation and the disposal of confiscated material.

#### 14.4.2 Policy statement

1. Ezemvelo KZN Wildlife will co-ordinate the return of all confiscated cycads originating from outside KwaZulu-Natal to the province of origin.
2. Salvaged and confiscated cycads will be disposed of by the following hierarchical sequence of options:
  - (a) enhance or establish wild populations provided the habitat is suitable and provided the material does not place *in situ* populations at risk of genetic or pathogenic contamination,
  - (b) offer material to recognised *ex situ* conservation projects in KwaZulu-Natal or South Africa,
  - (c) make material available for loan to recognised botanical institutions for educational purposes,
  - (d) make material available to gardens in Ezemvelo KZN Wildlife protected areas for landscaping and educational purposes provided the material does not place *in situ* populations at risk of genetic or pathogenic contamination,
  - (e) failing the above (sections (a) to (d)), cycads will be disposed of by sale, auction or tender.

#### 14.5 Marking of cycads

##### 14.5.1 Rationale

All cycads in the wild are vulnerable to illegal harvesting by a variety of users. Marking wild cycads and cycads in private collections with a uniquely numbered microchip is an effective deterrent and has proved invaluable when identifying confiscated material for criminal proceedings (Principle 1). The subsequent disposal of confiscated material that is marked is also less complicated. The marking of wild cycad populations will be prioritised according to level of threat.

##### 14.5.2 Policy statement

1. Ezemvelo KZN Wildlife will mark, by microchip, all cycads with a stem diameter of 150mm or greater, or 70mm for *E. cerinus*, *E. caffer* and *E. ngoyanus* that are:
  - (a) to be exported from KwaZulu-Natal,
  - (b) sold by auction or tender by Ezemvelo KZN Wildlife.
2. The cost of the microchip will be borne by the party applying for the export permit, or the buyer.