PRACTICAL GUIDELINES

FOR THE

RESTORATION OF RENOSTERVELD

Cornelia B. Krug

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Dedicated to
The Members of the Renosterveld Conservancy

and to
all Involved in the Renosterveld Restoration Project

Krug, C.B. (2004):
Practical Guidelines for the Restoration of Renosterveld
University of Stellenbosch

Photographs by the Author unless otherwise indicated

An electronic copy of the booklet is available at
http://academic.sun.ac.za/consecol/RenosterveldRestorationProject/index.htm

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Acknowledgements & Contributions:

The Renosterveld Restoration Project was generously funded by the WWF-SA / Table Mountain Fund (Grant ZA5035). Their funding provided bursaries for RM Krug, N Farley, NN Shiponeni and BA Walton, and covered all running costs for the project.

Additional funding for CB Krug and BA Walton was provided by the National Research Foundation (GUN 2053674, Prof SJ Milton).

The Government of Gabon provided a stipend to D Midoko Iponga.

Research for the project was conducted under the auspices of the Conservation Ecology Department at the University of Stellenbosch.

I am indebted to Prof Sue J. Milton for her tremendous support and guidance throughout the project.

The following students conducted research on the various aspects of renosterveld and renosterveld restoration: Nicola Farley (Habitat Use of Game), Rainer M. Krug (Renosterveld Pattern and Processes), Donald Midoko Iponga (Establishment of Shrubs and Restoration Trials), Ndafuda N. Shiponeni (Seed dispersal) and Benjamin A. Walton (Secondary Vegetation Succession). With their hard work and dedication, they contributed to the project's success, and their research results provided the basis for this handbook.

CapeNature granted the collection permit, and gave access to Voëlvlei Water Treatment and Waterval Nature Reserve.

Elizabeth Parker, Mike Gregor and Bernard Wooding at Elandsberg not only allowed access to their land, but enthusiastically supported all research projects and provided logistic support whenever necessary. Steve Mitchell granted access to Krantzkop (Somchem).

Printed at the University of Stellenbosch.

Table of Contents

The purpose of this book

This book aims to provide a background on renosterveld, outline the research conducted within the Renosterveld Restoration project, and provide practical restoration guidelines for the restoration of renosterveld vegetation. At the end of the book, a number of useful contacts will be listed.

While our research has been conducted in west coast renosterveld, the guidelines set out can also be applied to south coast renosterveld, and can be adapted for mountain renosterveld. Throughout the book, when talking about renosterveld, I refer mainly to lowland (coastal) renosterveld.

The book is primarily aimed at landowners and farm managers, agricultural and conservation extension officers, conservation managers, but also at anybody interested in renosterveld.

The sections of the book are outlined below:

An introduction to Renosterveld: This chapter gives the background on Renosterveld – what is it, where to find it, and the history of the vegetation.

Why restore Renosterveld: This chapter highlights why renosterveld is special, and why we need to conserve and restore it.

"Natural Restoration": Return of Natural Vegetation: Here it is explained how natural vegetation returns to a previously disturbed site, which processes are involved and why this knowledge is important for restoration.

Renosterveld Restoration: This chapter discusses potential goals and aims for the restoration of renosterveld, and provides guidelines for successful restoration of renosterveld.

Species Lists: Here, some of the species occurring in renosterveld are listed.

Useful contacts: In this section, contact details of persons and organisations concerned with the conservation and management of renosterveld are listed.

Further Reading: Here, further texts are listed which give more information on Renosterveld plants in renosterveld, etc ….

Glossary: In this section, specific terms are listed and explained in short.

Summaries of **Research Results** are provided in these boxes.

Explanations of specific terms are given in boxes like this.

An introduction to Renosterveld

What is Renosterveld?

Renosterveld is a vegetation type of the Cape Floristic Region. It is a shrubland with a dominance of aromatic shrubs, mostly of the daisy family. Other important plant components of this vegetation are grasses (both bunch and lawn grasses), and a multitude of bulb plants. In general, this vegetation is associated with fertile shale derived soils in the low-lying areas (50 – 500m a.s.l.), but it is also found on other soil types (granite, dolerite, quartzite, silcrete). It occurs in areas where the rainfall ranges between 250 – 600mm per year, with the majority of the rain falling in the winter months. Special about renosterveld is the multitude of bulb plants (Irises, Lilies, Amaryllids, Orchids), which put on a spectacular flowering display during late winter, spring and early summer.

In the western part of the Cape Floristic Region, where most of the rain falls during the winter months, renosterveld has more shrubs and bulbs in proportion to grasses. In the south-western and southern parts, where rain falls throughout the year, grasses are more dominant in relation to shrubs and bulbs.

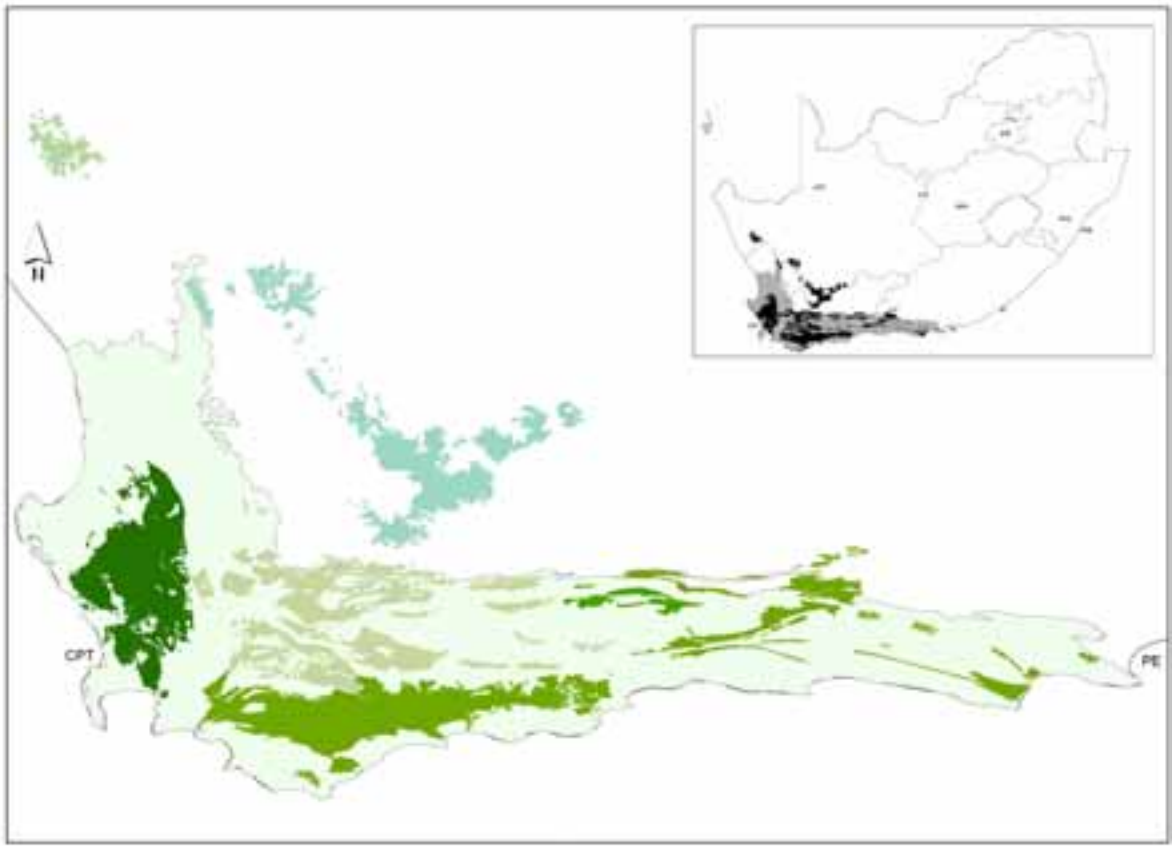


Figure 1: The original extent of renosterveld. The light green (grey area in the inset) demarcates the Cape Floristic Region, the darker green areas (black in the inset) the extent of renosterveld. One can distinguish between lowland renosterveld (dark and bright green) and mountain renosterveld (turquoise, pale green and pale olive). Information extracted from Low and Rebelo (1996), additional information from Mucina and Rutherford (2004).

Renosterveld and Renosterbos – what's in a name?

Renosterveld is the name of a vegetation type which occurs in the Western and Southern Cape. **Renosterbos** is one type (or species) of plant, with the scientific name *Dicerothamnus rhinocerotis* (gr. Diceros = two horns, Genus name for the black rhino, lat. thamnus = shrub, gr. rhinocerotis = similar to a rhinoceros). While the Renosterbos is the dominant shrub in most renosterveld remnants, this does not mean that renosterveld only occurs where the renosterbos is present, or that the presence of renosterbos is an indicator for renosterveld.

With the overgrazing of the veld by livestock in late 19th and early 20th century, the renosterbos became more and more dominant, and replaced other, more palatable shrubs and grasses. Many farmers at the beginning of the 20th century regarded the renosterbos as an invader plant, but also used it as an indicator for soil suitable for wheat planting.

Why renosterveld (literally rhinofields) is named after the rhinoceros (afr. renoster) is not quite clear. There are a few explanations where the name renosterveld came from. When viewed from a distance, the structure and colour of the shrubby vegetation (and the renosterbos in particular) resembles the hide of a rhino. Also, the early settlers arriving in the Cape reportedly encountered rhinos in this vegetation type, and Jan van Riebeeck recorded that the black rhinoceros actually browsed the renosterbos and other shrubs in renosterveld.

Renosterveld History

Renosterveld did not always look the way as we know it today. It was once the home of large herds of game in the Western Cape. Two species of antelope only occurred in renosterveld: the now extinct Blue Antelope or Bloubok (*Hippotragus leucophaeus*), a close relative of Roan and Sable, and the Bontebok (*Damaliscus dorcas dorcas*). Another, now extinct species, the Quagga, closely related to the Plains (Burchell's) Zebra, was very common in the Western Cape region (renosterveld and karoo). Among the large herbivores occurring in renosterveld were grazers, browsers and mixed feeders. The vegetation, as can be inferred from the large herbivores, was very likely a mix of shrubs and grasses, and with a substantial bulb component. The proportion of grasses was very likely higher than today. Reports of the first Europeans settlers speak of Tygerberg and Signal's Hill covered knee-high in grasses – most likely bunch grasses like *Ehrharta, Eragrostis, Merxmuellera, Pentaschistis, Tribolium,* and *Themeda*.

The landscape, however, was already influenced by humans when the European settlers arrived. About 2 000 years ago, the indigenous Khoekhoen adopted a herding lifestyle, and herds of 10 000 – 20 000 cattle and sheep were reportedly kept in the area that is now the Western Cape. To maintain grazing for the livestock, the Khoekhoen used to burn the veld after heavy grazing, and returned one to four years later to the burnt sites, where fresh grazing was now available. Burning increased the proportion of grasses and annuals, as well as bulbs, and reduced the shrub component.

With the arrival of the European settlers, the big herds of game were hunted to extinction. This changed the face of the vegetation. While migratory grazing and browsing at low levels, like that of game, or the Khoekhoen herds, encourages the growth of palatable grasses and shrubs, "sedentary" overgrazing (when livestock is kept in camps and on farms) allows unpalatable shrubs (like Renosterbos) to grow. Thus, with the removal of indigenous grazers and browsers, combined with the encampment of livestock and the repression of fire, unpalatable shrubs took over. This, together with the ability of renosterbos to spread very quickly, resulted in renosterveld as we know it today – a shrubby vegetation mainly dominated by renosterbos.

Early farmers regarded the renosterbos as an indicator for good farmland, and owing to the fact that renosterveld is associated with fertile soils, moderate rainfall and flat topography, this provided perfect opportunities for crop farming. Therefore, most of renosterveld in the low-lying areas had to make way for wheat fields, vineyards, olive groves and orchards. In addition, the urban settlements expanded and further encroached into renosterveld.

Renosterveld Today

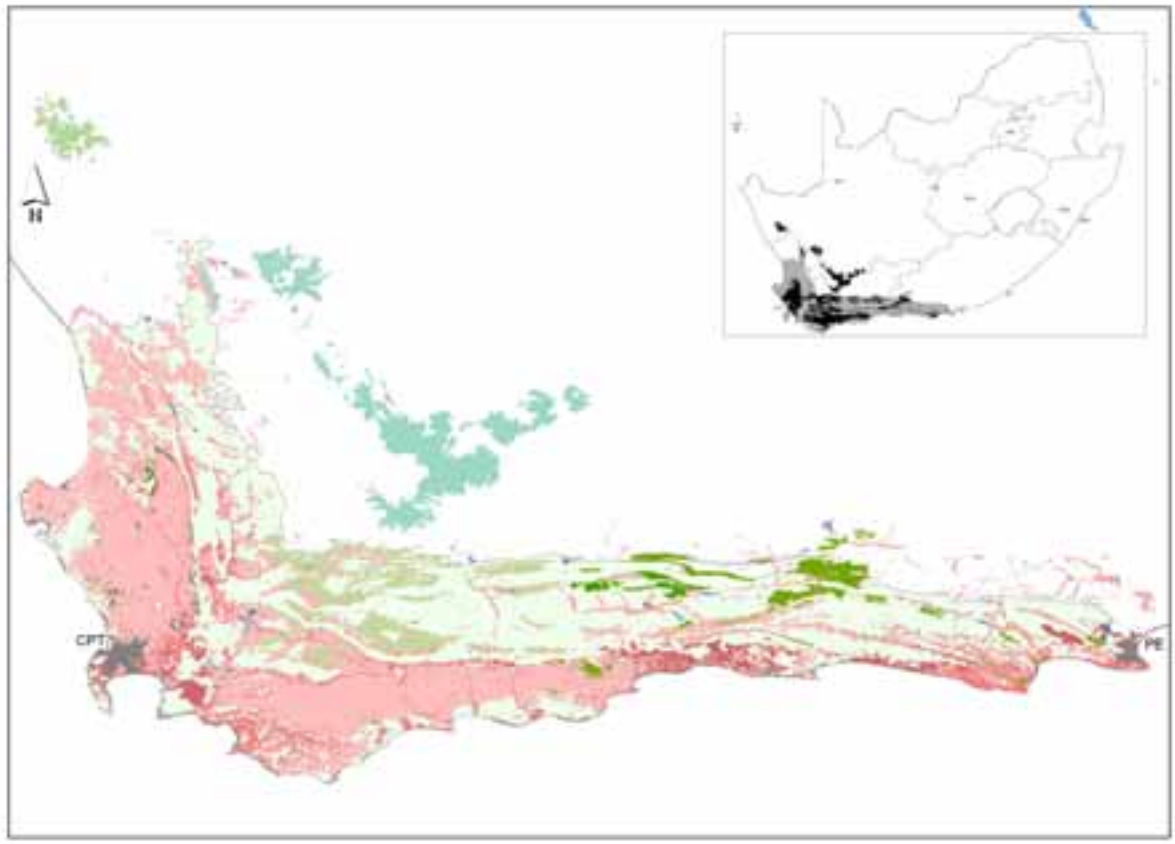


Figure 2: Current state of renosterveld. Most of the low-lying areas in the Boland and Overberg have been transformed (agriculture pink, alien invasions red, urban areas grey), leaving only remnants of the original extent (green – distinctions as Figure 1). Most of the lowland renosterveld areas have disappeared, while most of the mountain renosterveld is left untouched. Overall, nearly 60% of the mountain areas of the Cape Floristic Region are still in a pristine state, while the same is true for less then 5% of the whole lowland areas. Information extracted from Low and Rebelo (1996), additional information from Mucina and Rutherford (2004).

Resulting from a transformation spanning 2 000 years, only a few patches of the original extent of renosterveld remain. Most of the vegetation is restricted to small remnants surrounded by agricultural or urban areas, and is dominated by a single plant species. Less than 2% of the vegetation is formally conserved, and many renosterveld remnants are in private hand.

In the west of the Cape Floristic Region, in the Boland, renosterveld has made way mostly for vineyards, but also olive groves and orchards. In the Swartland, main crops are cereal, with the number of areas under vines increasing. However, in this region, the two largest fragments of renosterveld remain: at Elandsberg Nature Reserve near Hermon, and at Tygerberg Nature Reserve, in the heart of Bellville and Durbanville, Cape Town.

Figure 3: "Renosterveld" near Stellenbosch. Most of the land has been converted to vineyards, leaving very few small remnants of natural vegetation.

Along the south-west and south coast, in the Overberg and on the Agulhas Plain, renosterveld has been replaced by cereal crops, and more recently, canola. Small renosterveld fragments are still abundant in the area, and these are often used for livestock grazing, especially in the southern part of the region.

Figure 4: JN Briers-Louw Provincial Nature Reserve on Farm Eenzaamheid, near Paarl. The 29ha reserve (in the centre of the picture) is surrounded by vineyards (forground), wheatfields (centre right) and alien vegetation (centre left) – a fate it shares with many renosterveld fragments in the Winelands. Photograph by RM Krug.

Figure 5: Renosterveld remnants in the Overberg near Caledon. Remaining renosterveld fragments are usually small, surrounded by wheat fields or other agricultural fields, and thus isolated from each other. Drainage or contour lines with natural vegetation (as seen in the middle ground on the right) act as "corridors", linking vegetation fragments to each other by allowing for movement of species between these fragments. Photograph by RM Krug.

Spots on the mountains: Heuweltjies

Heuweltjies (underground termite colonies) are an important feature of renosterveld in the Boland and Swartland. The mounds are created by harvester termites (*Microhodotermes* viator), and some of them are thousands of years old. Due to the termite activity, soil is enriched with nutrients, and attracts a thicket vegetation dominated by wild olives (*Olea* sp.), Taaibos (*Rhus* sp.), and Gwarribos (*Euclea* sp.). The thicket vegetation is maintained by birds, which like to roost in the trees, and drop seeds of the fruits of thicket trees onto the ground. Grazing and browsing animals are also attracted to these heuweltjies, as the plants growing in these areas are more nutrient rich than in the surrounding veld. Thus, they deposit dung on the heuweltjies, adding further nutrients to the soil, and depositing seeds of preferred plants there. Many grazing lawns start out on a heuweltjie and are then maintained by the animals feeding on the grass. Aardvarks, but also rodents, are attracted by the termites, which they feed on. Many heuweltjies are thus covered in holes of different sizes.

Figure 6: Wild olive and other fleshy shrubs on a heuweltjie at Elandsberg Nature Reserve. Photograph by SJ Milton.

The heuweltjies are visible in the landscape – they appear as round "spots" of different colour e.g. on the Tygerberg, Paardeberg and Kasteelberg, as well as and other mountain slopes. Even in transformed areas, heuweltjies can still be seen. In wheatfields, heuweltjies appear darker than the surrounding soil, and the wheat growing on them is taller. In vineyards, grapes growing upon heuweltjies differ from the surrounding grapes in sugar content and ripening time. They are usually sweeter and ripen faster.

Figure 6: Heuweltjies visible as darker spots on the lower slopes of the Simonsberg, near Stellenbosch.

Why Restore Renosterveld?

Conservation of Renosterveld

There are a number of reasons why renosterveld needs to be conserved and restored. The International Union for Conservation of Nature and Natural Resources (IUCN) recommends that 10% of each habitat type on earth should to be under conservation. In order to meet the IUCN conservation goal for renosterveld, nearly 99% of which has been transformed, it is necessary to reclaim abandoned previously transformed areas, like old agricultural fields, as well as degraded natural areas, and restore renosterveld on these.

Cape Floristic Region:

A floral region (floral kingdom, floral realm) is a biogeographic region where plants share similar characteristics and endemism is high. Six floral regions are commonly distinguished: Boreal (Holarctic), Paleotropical, Neotropical, Cape, Australian, and Antarctic. Some add a seventh floral region, the oceanic floral region, which encompasses the world's oceans.

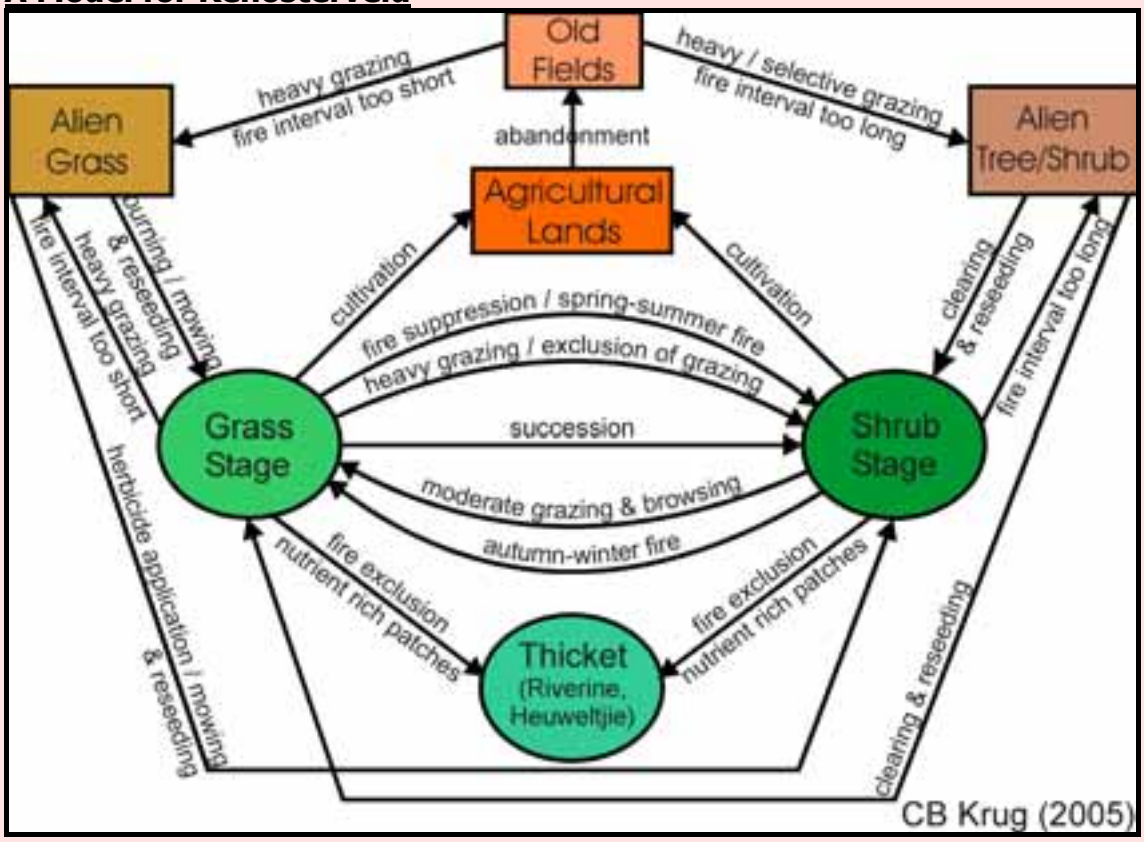
Of those floral regions, the Cape Floral Regions is the smallest (90 000km^2, or 0.05% of the earth's land surface), but in relation, the most species rich. More than 9 600 plants species (3% of the world's plant species) occur here. Nearly 70% of those are endemic, occurring only in the Cape Floral Region, and nowhere else in the world.

Renosterveld is part of the Cape Floristic Region, one of the regions of the world with the highest biodiversity, and a high degree of endemism. The Cape Lowlands are regarded as one of the 25 "hottest" hotspots of biodiversity. This means that renosterveld, which is a vegetation with a high number of species and many endemics, is under severe pressure due to habitat transformation and fragmentation. Renosterveld is regarded as one of the most highly transformed and underconserved vegetation types in South Africa. Thus, it was recognised by C.A.P.E. as being 100% irreplaceable, meaning that all remaining renosterveld areas, regardless of whether they are large or small remnants, are essential for the conservation of this vegetation type. For successful conservation of the Cape Floristic Region, the following conservation targets were set: All ecosystems and species must be conserved, and to secure long-term persistence of these ecosystems, ecological and evolutionary processes need to be maintained.
This approach ensures that a very special vegetation type will be kept for future generations.

Restoration and Conservation

By restoring renosterveld in degraded areas and on abandoned agricultural fields, we are contributing directly to the conservation goal for the Cape Floristic Region. Restored areas serve as important refuge areas for plant and animal species in transformed landscapes, provide important ecosystem services to the surrounding lands, and act as corridors or "stepping stones" linking larger vegetation remnants. Restored areas therefore directly contribute to maintaining and increasing biodiversity in transformed landscapes.

A Model for Renosterveld



This State and Transition Model illustrates different vegetation stages ("states") of renosterveld, and which factors and ecological processes lead to the change from one state to the next ("transition").

Three vegetation stages can occur in renosterveld: a **grass** dominated state (grass stage), a **shrub** dominated state (shrub stage), and a **thicket** stage.

Thicket vegetation, a vegetation with a large number of fleshy fruited shrubs and trees, is restricted to heuweltjies, or riverine and kloof areas. On heuweltjies, soils are more nutrient rich than in the surrounding areas (see also text box on heuweltjies), and can thus support trees and large shrubs. The trees attract bird species feeding on their fleshy fruits, which then disperse these seeds, usually to under their perching sites. River banks and kloofs can support trees because more moisture (water) is available. Fire is usually excluded in thicket areas, allowing trees to grow and mature.

Grasses are more dominant in renosterveld when the vegetation is regularly browsed and grazed on a moderate level, or burnt in autumn/winter at regular intervals. It is believed that renosterveld has a burning frequency of about ten to fifteen years. Many grass seeds are dispersed in the dung of animals grazing the vegetation.

Renosterveld is dominated by **shrubs** when browsing and grazing animals are excluded. Shrubs are also favoured when fires are suppressed or the vegetation is burnt in spring/summer, which is rare. However, heavy grazing of renosterveld will lead to cover of mostly unpalatable shrubs, like renosterbos.

Overgrazing and/or burning renosterveld too frequently enables alien grass species to invade the vegetation, while infrequent burns and long fire intervals facilitate the invasion of alien trees and shrubs.

"Natural Restoration": Return of Natural Vegetation

Rates of Return

The return of natural plant and animal communities to a previously disturbed site can only be successful when new plant and animal species are able to reach the site, establish themselves and survive. To be able to reach a disturbed site, e.g. an abandoned agricultural field, species must either occur in the surrounding area, or must be able to travel (disperse) to the site. While animals can usually travel by themselves to disturbed sites, provided they can move through the surrounding areas (natural vegetation, agriculture, urban), plants rely on carriers (e.g. wind, animals) to reach the site.

Once the species have successfully arrived at the site (e.g. plant seeds were carried there by wind or animals), they face the next hurdle: establishment. Species can only establish at those sites where environmental conditions (soil, soil nutrients, water availability and climate) are right for them. For example, a plant species needing nutrient rich clay soils will not be able to establish successfully on a very nutrient poor sandy soil. In addition to environmental conditions, establishment of a species also depends on other plant and animal species already present on the site. Even if environmental conditions are right, a species might not be able to establish when it is exposed to competition for specific resources (e.g. nutrients, water, light, space) from other species, or if it is heavily preyed upon or parasitized.

To complete the process, species that have established on the site, must now grow and survive and reproduce. For this, sufficient nutrients and water must be available, and climatic conditions must be right. A lack of resources (nutrients or water) might mean that a plant dies back, or that growth and reproduction (flowering, seed set) is reduced. When species do not have enough resources available, they are more likely to suffer from environmental stress (conditions at the site are too hot, too cold, too dry, or too wet), are more likely to experience competition, and are unable to fend off parasites or predators.

Research Results: Rates of Return of Renosterveld (BA Walton)

After about 35 years, the structure of the vegetation on old fields is very similar to that of natural Renosterveld. These recovered fields have a shrub cover that is very similar to the untransformed areas.

However, the number of different plant species found on recovered fields is considerably lower than in untransformed areas. This is due to a loss of grass and herb species, but mostly bulb species, which make Renosterveld so special.

Return of Natural Vegetation: the Role of Seed Dispersal

Due to the fragmentation of renosterveld, and the resulting isolation of vegetation remnants, plants often do not grow near the areas to be restored. Thus, their seeds have to cover large distances to reach these sites. Only seeds that can be carried by the wind, or those that are moved by animals, are able to travel far.

In renosterveld, these are the seeds of wind-dispersed shrubs and grasses. For seeds that rely on animals to get to new areas, this is not as easy, as their carriers (grazing and browsing animals) have mostly disappeared. Seeds of many bulb species, can travel only over short distances, and are thus unable to reach sites that need to be restored. This explains in part why naturally recovered renosterveld areas are dominated by shrub species, and especially bulb species are missing.

Research Results: Seed dispersal (NN Shiponeni)

The majority of seeds in renosterveld are dispersed by wind or in the dung of large herbivores.

Seeds of shrubs and tussock grasses are equipped with plumes or parachutes that allow them to be carried by the wind. Lawn grasses, forbs and some geophytes have hard seeds that survive the passage through the gut of an animal. These seeds are eaten when the animals graze or browse, and passed with the dung. The seeds are "planted" with fertiliser, giving them a better chance to establish and survive.

Bulb species have very varied seeds. Most seeds are large and round, which enables them to tumble on the ground. In Amaryllids, the whole seed head breaks off, releasing the seeds while tumbling on bare ground. In Iris and Oxalis species, seeds simply jump or fall out of the seed heads, and do not rely on wind or animals for further dispersal.

Therefore, some seeds can travel large distances (those seeds carried by wind, and by animals), while others only travel only short distances (tumbling seeds, or those falling from the seed head).

Many renosterveld bulb species have an additional way of moving around – the main bulb or corm is surrounded by small bulbs, called bulbils. These break off when the main bulb is disturbed, e.g. when it is pulled down by molerats, dug up by porcupines or other small mammals, or the ground is disturbed by hoof action.

Thus, to facilitate the return of indigenous vegetation, ways need to be found to increase the number of seeds reaching a renosterveld patch. This can be done be re-introducing indigenous grazing and browsing species, which will disperse seeds of grasses, forbs and geophytes. However, care needs to be taken, as many alien grass species are dispersed by grazers – animals do not distinguish between indigenous and alien species when feeding. Seeds that tumble along the ground can only do so when their path is clear. Species with such seeds rely on trampling by animals or fires that open up the vegetation cover.

More often than not, man needs to lend a helping hand to ensure that seeds of indigenous species reach areas that need restoring. This can be done, for example, by broadcasting seeds manually.

Return of Natural Vegetation: Seedling Establishment

Land transformation does not only influence the ability of seeds to travel across the landscape. When concerned with the restoration of abandoned old fields, for example, on has to keep in mind that previous land use impacts on the ability of seeds to germinate, and seedlings to establish.

Use of fertilisers, for example, leads to a change soil chemistry and nutrient composition. After years of agricultural practices, micronutrients, which could be important for seedling establishment are often lacking in the soil. Soils of old fields often have very high nitrogen concentration, which can be detrimental to some indigenous species. When the field to be restored is surrounded by active agricultural fields, the runoff of herbicides and other pesticides can affect the establishment and growth of indigenous species.

Many old fields colonised by weeds or alien grasses, and small fragments of natural vegetation are more likely to invaded by weeds and alien species. These species present on the areas to be restored are competing with the indigenous species for nutrients and water, thus preventing indigenous seedlings from establishing successfully, or affecting their growth and survival.

Research Results: Establishment of shrubs (D Midoko Iponga)

When investigating growth and survival of shrub seedlings on old fields, he found that these seedlings were far more affected by grass competition than grazing by large herbivores.

Grasses take away nutrients and water from the shrubs. Thus, the seedlings did not grow very well, and more than half died in the first year after germination. In places were grass cover was removed, either by hand weeding or grazing by large herbivores, shrub seedlings survived and grew better.

In a natural system, Renosterveld shrub species establish on patches that are opened up by grazing and trampling, or small-scale fires. Therefore, to successfully re-establish Renosterveld shrub species on old fields, grasses need to be removed first.

Seedlings of Wild Olive were however damaged by browsing antelope, and grew best in areas where they were sheltered by grass. This species, as well as others (*Rhus* sp. - Taaibos, *Euclea* sp. - Guarri) are restricted to *heuweltjies* (underground termite colonies), where the soil is very nutrient rich, and plants grow in high densities. These species must therefore be able to withstand competition when establishing and growing.

Therefore, to facilitate the establishment of indigenous species on abandoned old fields, weeds and alien grasses need to be removed. Potential methods to remove grasses are the application of herbicide, mowing and burning. Changes in soil chemistry, however, are not easily reversed. The establishment of indigenous species might aid in returning the soil to a more "natural" state.

Figure 7: The unweeded, unprotected (against herbivory) plot 18 months after the experiment began. The plot is covered with grasses, none of the 25 indigenous seedlings planted survived.

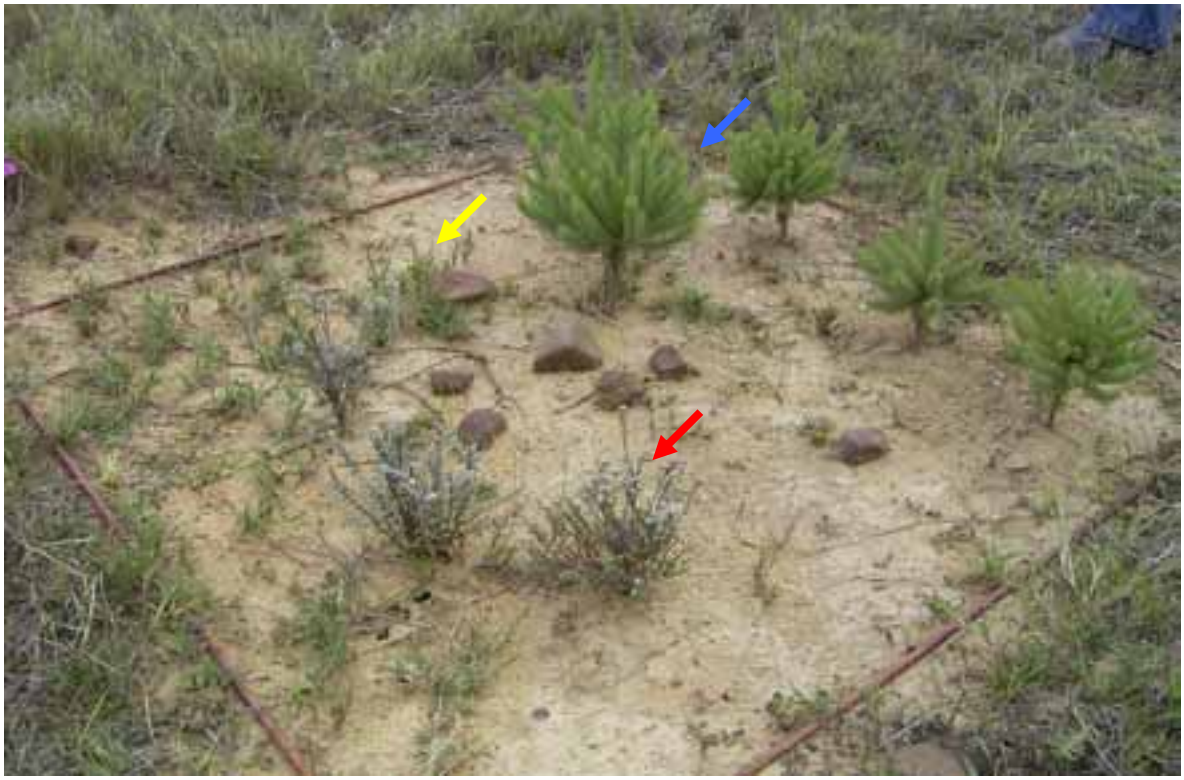


Figure 8: A plot where the grass biomass was removed by weeding on a regular basis. Seedlings were grazed by antelope present at the study site. Most of the seedlings planted survived, although their growth is stunted by grazing. *Leucodendron corymbosum* (blue arrow), *Salvia chamaelagnaea* (yellow arrow) and *Athanasia trifurcata* (red arrow).

Figure 9: One of the unweeded, from herbivory protected plots. Only seedlings of wild olive survived (yellow arrow), seedlings of the other species died down.

Figure 10: In this plot, which was weeded and protected from grazing, nearly all shrub seedlings survived, and grew well. *Leucodendron corymbosum* (blue arrow), *Salvia chamaelagnaea* (yellow arrow), *Relhania fruticosa* (pink arrow) and *Athanasia trifurcata* (red arrow).

Restoration

Aims – What do we want to restore?

Before one can begin the physical restoration process, it is essential to think about what is to be achieved with the restoration of e.g. an abandoned agricultural field. Is the goal to restore the field for purely aesthetic reasons, to return bulb species to an area where they occurred before, or will the area be used for game or even livestock farming? Each of these goals needs a different approach to reach the objective – a restored areas suitable for the purpose intended.

The current state of the area to be restored has also to be taken into consideration: is the site mainly covered by alien plants (grasses, weeds, even trees), or is natural vegetation, albeit in a degraded state, already present? Again, the approach taken depends very much on the starting point. An agricultural field covered in alien grasses needs more intervention than a small vegetation remnant with low species diversity.

Often, it is also useful to know how the area looked like before it was transformed – old photographs, or accounts of previous owners might be useful tools to learn how the vegetation looked a few decades back, and which species were present at the site. Other important considerations are the environmental conditions of the site. Is it wet or dry? What is the topography of the site? Is it on a slope or flat? Is the soil heavy clay, loam or sand? What is the aspect? North or South? All these parameters determine which plant species will be suitable for restoration. A species that prefers damp areas will not grow on a very dry slope, while a plant usually growing on a dry north facing slope will not do well in a shady damp area. Here, it is also useful to get an idea which species were present at the site before it was transformed or degraded, as these species are adapted to the environmental conditions at the site or the region.

NB: It is always a good idea to bring back what has been lost, but introducing new species to an area where they never occurred before is never a good plan, even if the species are indigenous to Renosterveld.

As renosterveld is a shrubland with a bulb and grass component, the aim for the restoration of a site should be to establish a mix of shrubs, grasses, and bulb species. When the site is to be used for game farming, the grass and shrub component should be rather high, to provide graze and browse for the antelope species. Bulb species provide an important food source for grazers. On the other hand, when bulb species are the main focus of restoration, their proportion needs to be larger. Most bulb and grass species need open areas between shrubs, so disturbances (trampling by antelope, browsing, grazing and small scale fires) are necessary to create open patches within the vegetation. However, this will only be of concern once the shrub species reach a certain height, and close shrub cover is developing on the site.

Guidelines for Restoration: How to Restore

For the successful restoration of old agricultural fields (but also other disturbed areas), a two-way approach needs to be taken: First, any undesired vegetation must be removed. In the case of old fields, these are mainly alien grasses and weeds. In other cases, the removal of shrubs and trees, like pines or wattles might be necessary. Once the alien vegetation has been removed, seeds of indigenous species must be brought onto the area to be restored, as this might or cannot happen naturally, especially if the restoration site is isolated from natural vegetation.

Treatment Options

Research Results: Restoration Trials (D Midoko Iponga) I

Three methods were tested to remove grass from old fields: burning, mowing and herbicide application.

Table 1: Response of number of species, species diversity and cover of selected species groups one year after treatment. - decrease, o no change, + increase)

Treatment / Response	Burning	Mowing	Herbicide application
Species number	**-**	**-**	**--**
Species diversity	**o+**	**o-**	**o-**
Alien grass cover	**-**	**-**	**--**
Indigenous grass cover	**o-**	**o+**	**-**
Shrub cover	**-**	**o**	**o**
Bulb and herb cover	**o+**	**o+**	**++**

Herbicide application proved to be most effective in reducing the cover of alien grasses on the old field. The decrease in species number can be attributed to the loss in grass species. Although burning and mowing reduced grass cover, the effect was not as great, as the grasses recovered after the winter rains. Shrubs were not affected by mowing and herbicide application, but were destroyed by burning, and recovery was slow. Bulbs and herbaceous species profited most from the application of herbicide.

To remove unwanted vegetation, the application of herbicide is the most effective option. The herbicide must be carefully selected, as it should be specific to the plants targeted, and it should destroy the seeds of the target species. In our experiment, we used Gallant Super®, a selective pre-emergence, systemic herbicide for the control of annual and perennial grasses. If pines and wattles are to be removed, Working for Water should be contacted for suitable methods and potential assistance.

Application of the herbicide must be carefully timed. Ideally, spraying should be conducted just before the germination of the seeds, as they are then most metabolically active and take up the herbicide. In the Western Cape, the best time for this is autumn, before the start of the first winter rains. It is advisable to repeat

the herbicide application after one month, to allow for seasonal and annual variation in germination periods. CapeNature has been very successful in removing alien grasses from old fields by applying herbicide, followed by a burn and a repeat of the herbicide application.

When seeds of indigenous species are to be broadcast on areas to be restored, treatment should be completed at least one month before sowing to allow for the herbicide to decay. As most indigenous species should be sown in March and April, the following is recommended:
First application of the herbicide in January, immediately followed by irrigation of the area to initiate germination. The application of the herbicide is then repeated a month later, in February, again followed by irrigation, and seeds can be broadcast from Mid-March onwards. When wishing to combine the herbicide application with burning, the veld should be burnt in about a month after the first herbicide application. The herbicide can then be re-applied two weeks after the burn.

When choosing and applying herbicides, the instructions of the manufacturers should be carefully followed, and all necessary precautions be taken. The amount of herbicide applied depends on the product selected, and the manufacturer's guidelines for application should be followed to ensure maximum effectiveness.

Figure 11: The old field to be restored at Elandsberg Nature Reserve, Bartholomeus Klip. The natural vegetation can be seen as dark band in the background of the picture. Note that Renosterbos has already established on the site, mostly along the drainage lines, otherwise, the field is mostly covered in alien grasses.

Research Results: Restoration Trials (D Midoko Iponga) II

After the old field was treated as outlined above, seeds of an indigenous grass (*Ehrharta calycina*, rooisadgras) and an indigenous shrub (*Eriocephalus africanus*, kapokbos), both occurring in Renosterveld, were broadcast on the treatment plots.

Seedlings of the **kapokbos** (*Eriocephalus africanus*) were found in all treatments in October, after the winter rains. The number of seedlings found, as well as the size of the seedlings was greatest in those plots where herbicide was applied. In the mowed treatment, very few seedlings established, and these died very quickly. A similar observation was made for the burning treatment – the number of seeds germinating was low, and seedlings died after a few weeks.

Seeds of the **rooisaadgras**, *Ehrharta calycina*, germinated in June in the mowed and burnt treatments. No seeds germinated in the plots were the herbicide (Gallant Super) was applied, as this herbicide prevents the germination of grass seeds. The number of seedlings was higher in the burnt sites than the mowed plots, but size of the seedlings was similar in both treatments.

Usage of herbicide to remove alien grasses is suitable for the establishment of shrub species, but is less appropriate when indigenous grasses are to be sown. Here, a waiting period of one to two months is advisable after herbicide application.

Pat Holmes achieved very good restoration results of a lucerne covered field by using ploughing or herbicide to reduce the lucerne cover. A seed mix of indigenous and annual species was then broadcast.

Seed broadcasting

Time of seed broadcasting depends on the species selected. Some species germinate in the first winter rains, while others only germinate when temperature start rising again at the end of winter. Suitable seeding times in the Western Cape are in autumn (March / April) or early spring (September). Use the tables provided in this chapter as a guideline when sowing should occur. Most bulb species should be sown in March, herbaceous plants in March / April, and shrubs in April, some species in September. Grasses can be sown in April or September; rooigras *Themeda triandra* needs to be sown in January.

Flowering times (see species lists in Appendix A) also give an indication when seeds should be broadcast. Seeds of plants flowering throughout the spring and summer months can be sown at the end of autumn (March and April), while seeds of plants that flower during winter should be sown in early spring (September).

As mentioned above, a waiting period of about four to eight weeks should be observed after herbicide application to avoid that seeds are affect by the herbicide. Sowing can be repeated one to two weeks after the first broadcast, and seeds of species that require similar conditions can be mixed and sown at the same time. In general, related species can be prepared and treated the same way.

Sources where to obtain renosterveld seeds are still rather limited, and very few species are commercially available. Good starting points are the Worcester Veld Reserve, the seed room of the National Botanical Institute at Kirstenbosch (seed

catalogue available), nurseries specialising in indigenous species and commercial seed companies. For contact details, see Appendix B. Other farmers might be able to advise you where to obtain seeds of a specific species. Seeds can also be collected in the wild, but for this, a permit from the respective conservation agencies (CapeNature, Northern Cape Nature Conservation Services and South African National Parks) is required – contact the permit or district offices for more detail. In addition, the collection of wild seeds requires at least a basic knowledge of the plant species of an area – if in doubt; enrol the services of a botanist that knows your area well. Contact the Botanical Society or conservation agencies – they might be able to point you to the right person for the job. **NB**: many of the renosterveld bulb species are rare and should never be collected in the wild.

Also keep in mind that different "ecotypes" of a species exist, which are adapted to different environments. For examples, Rooigras *Themeda triandra* is a species which is widespread in South Africa, occurs in summer and winter rainfall regions. Seeds of plants from the summer rainfall region will not be able survive in the winter rainfall region, and vice versa. Seeds of *Themeda* are generally widely available, but these are of summer rainfall ecotypes, and thus not suited for the Western Cape. Caution is therefore advised when obtaining seeds from elsewhere in the country, especially from summer rainfall areas.

Seeds should be stored under cool, dry and dark conditions to avoid rotting and early germination. Dormancy needs to be broken in a very few cases – here seeds need to be soaked in warm water for a few hours before sowing. Seeds are usually broadcast directly onto the field, covered with a thin layer of soil and irrigated after sowing. The tables below provide more detailed instructions for selected species. The field should be irrigated regularly for the first month or two after sowing, to ensure germination. Irrigation is not necessary once the winter rains have started. Keep in mind, though, that not all seeds will germinate after sowing, and many seedlings will not survive a very dry winter.

Table 2: Sowing recommendations for selected grass species. Information compiled from van Oudtshoorn (1999) and Breda and others (1991).

Species Common Names	Seed Set	How to sow	Sow when	Remarks
Cenchurus ciliaris Foxtail buffalo grass, buffelsgras	August - September	Strip seeds from plants, sow directly onto soil.	April	difficult to establish in clay soils
Chaetobromus dregeanus Gha grass, Haartbeesgras, ghagras	September / October	sow seeds in damp soil.	April to May	
Digitaria eriantha woolly finger grass, vingergrass	February / March	pick entire inflorescence, rub seeds out before use. Sow on loosened soil.	September	
Ehrharta calycina common ehrharta, rooisaadgras, polgras	September / October	seed maturation very variable. Collect seeds with cloth spread around tussock, remove seeds on alternate days until all seeds have dropped. Sow directly onto loosened soil.	April	
Ehrharta melicoides	November	sow into containers and transplant into veld after 8 weeks. Plants can also be propagated by dividing at the base.	April	
Themeda triandra red grass, rooigras	January / February	cut culms with seed, tie into sheaves and place onto seed bed.	January / February	Seeds need post-ripening period. Sow in conjunction with *C. plurinoides*

Table 3: Sowing guidelines for selected shrub species and genera. Information compiled from Breda and others (1991) and Eliovson (1995).

Genus / Species Common Names	Seed Set	How to sow	Sow when	Remarks
Asphalatus Cape Gorse	September - February	Sow seeds directly onto soil and cover with a thin layer of soil. Irrigate after sowing.	April	seeds germinate easily
Athanasia klaaslouwbos	October - December	Sow seeds directly onto soil and cover with a thin layer of soil. Irrigate after sowing.	April	
Hermannia doll's rose, poprosie	July - October	Sow seeds directly onto soil and cover with a thin layer of soil. Irrigate after sowing.	April	
Indigofera indigo	May - February	Sow seeds directly onto soil and cover with a thin layer of soil. Irrigate after sowing, keep moist during germination (3-6 weeks).	September	
Lobostemum agtdaegeneesbos	July - February	Sow fresh seed directly onto soil. Cover with a thin layer of soil, irrigate after sowing. Keep moist during germination (5 weeks)	September	seeds difficult to collect
Othonna bobbejankool	June - September	Sow seeds directly onto soil and cover with a thin layer of soil. Irrigate after sowing.	April	
Polygala butterfly bush, ertjieblom	September - December	Sow seeds directly onto soil and cover with a thin layer of soil. Irrigate after sowing.	April	seeds germinate easily
Rhus karee, taaibos	September - April	Sow seeds directly onto soil and cover with a thin layer of soil. Irrigate after sowing.	April	grows easily from seed
Eriocephalus africanus wild rosemary, kapokbos	August - September	Sow into small furrows, a number of seeds together. Irrigate after sowing	April	
Helichrysum asperum geilsiektebossie	December	Mix seeds with sand and sow directly onto the soil	April	
Helichrysum hebelepis vetkos	November - December	Harvest seedheads when they start detaching from plant (October - Dec). Sow directly on soil.	April	needs to be sown together with other bushes
Euclea undulata Ghwarriebos	March	Pick fruits when ripe, place pips in boiling water to speed up germination. Sow in seedbeds and transplant after 6 months.	April	
Indigofera denudata indigo	October - November	Seeds can be sown directly onto the soil and covered with sand. Irrigate after sowing.	April	
Salvia chamelaeagnea blue sage, bloublomsalie	September	Collect pale brown capsules - they split to release seeds. Sow on top of loosened soil.	April	

Monitoring of Restored Sites

The work does not stop after treating the field, and sowing. The vegetation needs to be monitored on a regular basis to ensure that the species sown are in fact establishing, and to prevent the return of alien species to the restored site. Monitoring can be done on a monthly, quarterly, bi-annual or annual basis. The easiest way is to walk two or three transects of a set length (100m) across the field, and determining the species (genus, life form (shrub, grass, herb, bulb) at each fifth step. Changes in vegetation are determined by comparing the latest transects with previous observations.

Should the monitoring reveal that alien species are in fact returning to the site, appropriate measures need to be taken – weeding for example, or the re-application of herbicides. If only few of the sown species germinated or established, re-seeding might become necessary. The species chosen might not be appropriate for the site, so different species need to be selected.

Table 4: Sowing recommendations for selected herb genera. Information compiled from Breda and others (1991) and Eliovson (1995).

Genus Common Names	Seed Set	How to sow	Sow when	Remarks
Arctotis gousblom	July - December	Sow directly onto soil, cover with a thin layer of soil. Irrigate after sowing.	April	germination after 1 week
Asparagus katdoring, krulkransie, wilde aspersie	January - December	Soak seeds in warm water before sowing. Sow directly onto soil, and cover. Irrigate after sowing and during germination.	April	
Diascia twinspur	July - November	Sow directly onto soil, cover with a thin layer of soil. Irrigate after sowing.	April	perennial species can also be propagated by division
Felicia Astertjie	July - December	Sow directly onto soil, cover with a thin layer of soil. Irrigate after sowing.	March / April	
Pelargonium stork's bill, malva	August - February	Pick fruits before ripening and dry in paper bags. Sow directly onto soil, keep moist during germination.	March / April	germination after 1 week

Table 5: Sowing guidelines for selected bulb species. Information compiled from Eliovson (1955).

Genus Common Name	Seed Set	How to sow	Sow when	Remarks
Babiana bobbejankool	July - November	Sow directly on soil surface, cover with a thin layer of soil. Soil most be kept moist during germination (approx. 6 - 8 weeks).	March	Flowers occur in third year after seeding
Bulbinella katstert, cat's tail	July - October	Sow directly on soil surface, cover with a thin layer of soil. Keep soil moist until October.	March	flowers in second year after seeding
Cyanella raaptol	August - November	Sow directly on soil surface, cover with soil. Keep moist throughout germination.	March	germination after 1 month
Geissorhiza sysie	July - October	Sow directly on soil surface, cover with a thin layer of soil. Keep moist during germination.	March	germination after 1 month
Gladiolus pypie	August - September	Sow directly on soil surface, cover with soil. Keep moist until seedlings appear (2-4 weeks).	March	Flowers in third year after seeding
Haemanthus torch-lily, april-fool	February - June	Scatter seeds onto the soil. Keep soil moist until winter rain starts.	March	Flowers in third or fourth year after seeding
Ixia wand-flower, kalossie	July - December	Sow directly onto soil. Keep soil moist until winter rain starts.	March	Flowers occur in third year after seeding
Lachenalia viooltjie, naëltjies	July - October	Sow thinly directly onto soil. Keep moist until germination (1 month)	Mid-March	Flowers from second year from seeding
Moraea	July - December	Sow directly onto soil. Keep soil moist until germination (1 month)	March	Flowers in second or third year after seeding
Ornithogalum chincherinchee	August - January	Sow directly onto soil. Keep moist until seedlings appear (2-4 weeks).	March	Protect seedlings during first year
Oxalis sorrel, suring	April - November	Sow directly onto soil. Keep well watered until rain starts.	April	
Romulea froetang, satin-flower	June - November	Sow thinly directly onto soil. Keep moist until germination (1 month)	March	Flowers in third year after seeding
Sparaxis Cape buttercup, fluweeltjie	August - October	Sow directly onto soil. Keep well watered until germination (1 month).	March	Flowers in third year after seeding
Watsonia kanolpypie	September - January	Sow directly onto soil. Keep moist and shaded until germination (1 month), maintain watering until winter rain starts.	March	Flowers in third year after seeding

Appendix A: Species Lists for West Coast Renosterveld

The species lists provided are by no means exhaustive, and species composition varies between areas. This is especially true for the geophytic (bulb) species. To obtain lists of species occurring in your area, contact the Botanical Society or the district offices of CapeNature. Species list compiled from Walton (in prep), additional information from Goldblatt and Manning (2000): Cape Plants. Flowering times from Goldblatt and Manning (2000) and van Breda and others (1991).

Grasses

Family	Scientific name Common Names	habit	flowering	Remarks
Cyperaceae	*Chrysitrix capensis* kwasbiesie	perennial	April - November	
Cyperaceae	*Cyprus tenellus* matjiesgoed	annual	September - January	
Cyperaceae	*Cyprus usitatus* indian grass boesmanuintjie, hoendergras	perennial	December - April	
Cyperaceae	*Ficinia bergeana*	perennial	June - July	
Cyperaceae	*Ficinia indica*	perennial	July - November	
Cyperaceae	*Ficinia macowanii*	perennial	October - May	
Cyperaceae	*Ficinia oligantha*	perennial	September - January	
Cyperaceae	*Ficinia paradoxa*	perennial	May - November	
Cyperaceae	*Schoenoxiphium ecklonii*	perennial	June - October	
Cyperaceae	*Schoenoxiphium thunbergii*	perennial	July - October	
Cyperaceae	*Tetraria flexuosa*	perennial	January - May	
Cyperaceae	*Tetraria pillansii*	perennial	January - February	
Poaceae	*Agrostis lachnantha* Bent grass vinkagrostis	annual/ short lived perennial	October - March	damp areas, e.g. vleis
Poaceae	*Aristidia congesta* Tassel three-awn, katstertsteekgras	short lived perennial	December - May	
Poaceae	*Brachiaria serrata* velvet signal grassfluweelsinjaalgras	perennial	October - May	
Poaceae	*Cenchurus ciliaris* Foxtail buffalo grassbuffelsgras	perennial	August - April	
Poaceae	*Chaetobromus dregeanus* Gha grass Haartbeesgras, ghagras	perennial	September - November	
Poaceae	*Cymbopogon plurinoides* narrow-leaved turpentine grass smalblaarterpentyngras	perennial	October - May	
Poaceae	*Cymbopogon prolixus* tamboekiegras	perennial	October – April	
Poaceae	*Cynodon dactylon*	perennial	September –	

	Couch grass kweekgras		May	

Grasses ctd.

Family	Scientific name Common Names	habit	flowering	Remarks
Poaceae	*Digitaria argyrograpta* silver finger grass	perennial	November – March	
Poaceae	*Digitaria eriantha* woolly finger grass vingergrass	perennial	January – April	
Poaceae	*Diplachne fusca* Swamp grass kuilgras	perennial	October – May	damp areas, e.g. vleis
Poaceae	*Ehrharta bulbosa*	perennial	October – December	
Poaceae	*Ehrharta delicatula*	annual	July – November	in shade under bushes
Poaceae	*Ehrharta calycina* rooisaadgras, rooigras, polgras, common ehrharta	perennial	July – December	
Poaceae	*Ehrharta erecta*	annual	September – January	in shade under bushes
Poaceae	*Ehrharta longiflora* Oat-seed grass	annual	July – November	in shade under bushes
Poaceae	*Ehrharta thunbergii*	perennial	September – December	
Poaceae	*Eragrostis capensis* heart-seed love grass hartjiesgras	perennial	September – April	
Poaceae	*Eragrostis cilinensis* stinkgras	annual	October – June	
Poaceae	*Eragrostis curvula* Weeping love grass oulandsgras	perennial	January – December	
Poaceae	*Festuca scabra* Munnik Fescue, Munnik-swenkgras	perennial	September – December	
Poaceae	*Fingerhuthiana africana* kalkvingerhoedgras	perennial	September – December	
Poaceae	*Helictotrichon capense*	perennial	October – November	damp areas
Poaceae	*Helictotrichon hirtulum*	perennial	November – March	
Poaceae	*Helictotrichon turgidulum* small oats grasskleinhawergras	perennial	October – April	damp areas
Poaceae	*Heteropogon contortus* spear grass, assegaaigras	perennial	October – June	
Poaceae	*Hyparrhenia hirta* common thatching grass, dektamboekiegras	perennial	November – May	
Poaceae	*Karoochloa curva* oulandegras	perennial	October – December	in shade
Poaceae	*Koelaria capensis* polgras, strandgras	perennial	November – February	
Poaceae	*Melica racemosa* haakgras, dronkgras	perennial	October – March	
Poaceae	*Melinis nerviglumis* bristle-leaved red top, steekblaarblinkgras	perennial	November – December	

Grasses ctd.

Family	Scientific name Common Names	habit	flowering	Remarks
Poaceae	*Merxmuellera decora*	perennial	September – November	damp areas
Poaceae	*Merxmuellera stricta* Cape wire grass bokbaardgras	perennial	September – December	
Poaceae	*Pennisetum thunbergii* Thunberg's pennisetum,	perennial	October – June	vlei areas
Poaceae	*Pentaschistis airoides* common annual pentaschistis	annual	August – October	
Poaceae	*Pentaschistis eriostoma*	perennial	September – November	
Poaceae	*Pentaschistis glandulosa*	perennial	October – December	
Poaceae	*Pentaschistis pallida* dune grass	perennial	September – October	
Poaceae	*Poa bulbosa*	perennial	August – October	
Poaceae	*Schismus inermus* haasgras	perennial	June – February	
Poaceae	*Setaria spacelata* golden thimothy gras	perennial	September – March	disturbed areas
Poaceae	*Sporobulus africanus* Ratstail dropseed, taaipol	perennial	October – April	disturbed areas
Poaceae	*Sporobulus fimbriatus* bushveld dropseed, bosveldfynsaadgras	perennial	December – May	disturbed areas
Poaceae	*Stipa capensis* Kaapboesmangras	annual	August – November	disturbed areas
Poaceae	*Themeda triandra* red grass rooigras	perennial	October – July	
Poaceae	*Trachypogon spicatus* giant spear grass bokbaardgras	perennial	October – May	
Poaceae	*Tribolium acutiflorum*	perennial	September – December	
Poaceae	*Tribolium echinatum*	annual	September – October	
Poaceae	*Tribolium hispidum*	perennial	September – December	
Poaceae	*Tribolium obtusifolium*	perennial	September - November	
Poaceae	*Tribolium uniolae* koringgras	perennial	October - December	
Restionaceae	*Ischyrolepis capensis*	perennial	October - November	
Restionaceae	*Thamnochortus erectus*	perennial	September - October	
Restionaceae	*Thamnochortus lucens*	perennial	March - July	

Shrubs

Family	Scientific Name Common Names	habit	flowering
Aizoaceae	*Erepsia patula* Altydvygie	shrublet	January - May
Aizoaceae	*Galenia africana* Kraalbos, geekbrakbos	shrublet	October - December
Aizoaceae	*Galenia ecklonis* rooiloodjie	subshrub	September - October
Aizoaceae	*Lampranthus elegans* vygie	shrublet	September - November
Anacardiaceae	*Rhus laevigata* Dune taaibos, duinetaaibos	shrub	October - December
Asteraceae	*Athanasia pectinata* klaaslowbos	shrublet	October - December
Asteraceae	*Athanasia trifurcata* kouterbos	shrub	October - November
Asteraceae	*Dicerothamnus rhinocerotis* renosterbos	shrub	February - April
Asteraceae	*Eriocephalus africanus* wild rosemary, kapokbos	shrub	January - June
Asteraceae	*Helichrysum asperum* geilsiektebossie	shrublet	October - January
Asteraceae	*Helichrysum hebelepis* vetkos	shrub	August - September
Asteraceae	*Leysera gnaphalodes* skilpadteebossie, teringteebossie	shrublet	September - November
Asteraceae	*Relhania fruticosa* perdekaroo	shrublet	September - November
Asteraceae	*Senecio pubigerus* skraalbossie	shrub	March - July
Asteraceae	*Stoebe nervigera* hartebeeskaroo	shrublet	January - July
Asteraceae	*Stoebe plumosa* slangbos	shrub	April - June
Boraginaceae	*Lobostemon argenteus* agtdaegeneesbos	shrublet	July - February
Ebenaceae	*Euclea racemosa* bush guarri	shrub / small tree	December - June
Ebenaceae	*Euclea undulata* Ghwarriebos	shrub / tree	December - April
Fabaceae	*Aspalathus acanthopylla*	shrub	September - February
Fabaceae	*Aspalathus aculeata*	shrublet	October - January
Fabaceae	*Aspalathus alpestris*	shrublet	January – December
Fabaceae	*Aspalathus angustifolia*	shrublet	October – April

Shrubs ctd.

Family	Scientific Name Common Names	habit	flowering
Fabaceae	*Aspalathus lebeckioides*	shrublet	October – November
Fabaceae	*Aspalathus nigra*	shrublet	August – November
Fabaceae	*Aspalathus rycroftii*	shrublet	February – March
Fabaceae	*Aspalathus spinosa*	shrub	August – March
Fabaceae	*Aspalathus submissa*	shrublet	September – November
Fabaceae	*Aspalathus tridentata*	shrublet	October – December
Fabaceae	*Indigofera heterophylla* boontjiekaroo	shrublet	May – February
Fabaceae	*Lotononis prostrata*	shrublet	August – September
Fabaceae	*Otholobium candicans* ertjiekaroo	shrublet	September – November
Fabaceae	*Otholobium hirtum* skaapbostee	shrub	September – December
Fabaceae	*Otholobium pungens*	shrublet	September – January
Fabaceae	*Otholobium spissum*	shrub	October
Fabaceae	*Otholobium uncinatum*	shrub	November – January
Lamiaceae	*Salvia chamelaeagnea* blue sage, bloublomsalie	shrub	November – May
Lamiaceae	*Salvia runcinata* hardesalie, wildesalie	shrublet	October – April
Malvaceae	*Hermannia alnifolia* doll's rose, poprosie	shrub	July – October
Malvaceae	*Hermannia flammea* doll's rose, poprosie	shrub	September – October
Malvaceae	*Hermannia saccifera* doll's rose, poprosie	shrub	August – October
Oleaceae	*Olea capensis* Ysterhout	shrub/ tree	February – December
Oleaceae	*Olea europea africana* wild olive	shrub/ tree	October – March
Polygalaceae	*Muraltia ericifolia* purple-gorse, skilpadbos	shrub	December – January
Polygalaceae	*Muraltia ericoides* purple-gorse, skilpadbos	subshrub	July - September
Polygalaceae	*Muraltia thymifolia* purple-gorse, skilpadbos	shrub	July - September

Shrubs ctd.

Family	Scientific Name Common Names	habit	flowering
Polygalaceae	*Muraltia trinervia* purple-gorse, skilpadbos	subshrub	August - November
Polygalaceae	*Polygala fruticosa* butterfly bush, ertjieblom	shrub	September - November
Polygalaceae	*Polygala garcinii* butterfly bush, ertjieblom	subshrub	September - December
Proteaceae	*Leucadendron corymbosum* cone bush, tolbos	shrub	September - October
Proteaceae	*Leucadendron lanigerum* cone bush, tolbos	shrub	July - September
Proteaceae	*Leucospermum calligerum* pincushion, luisiesbos	shrub	July - January
Rhamnaceae	*Phylica plumosa* veerkoppie	shrublet	May - August
Rhamnaceae	*Phylica strigulosa*	shrublet	March - July
Rosaceae	*Cliffortia juniperina*	shrub	September - March
Rubiaceae	*Anthospermum aethiopicum* jakkalsstert	shrub	August - January
Rubiaceae	*Anthospermum galioides*	subshrub	July - January
Rubiaceae	*Nenax hirta*	shrublet	June - August
Thymelaeaceae	*Gnidia laxa* saffron bush, saffraan	shrub	January - December
Zygophyllaceae	*Zygophyllum sessilifolium* witspekbos	shrublet	July - September

Herbaceous Species

Family	Scientific Name Common Names	habit	flowering
Aizoaceae	*Carpanthea pomeridiana* vetkousie	annual	September - November
Aizoaceae	*Dorotheanthus bellidiformis* bokbaaivygie	annual	August - September
Aizoaceae	*Lampranthus filicaulis* vygie	perennial	June - July
Aizoaceae	*Lampranthus tegens* rankvygie	perennial	August - October
Aizoaceae	*Tetragonia nigrescens* kinkelbos, klapperbrak	perennial	July - October
Apiaceae	*Torilis arvensis* hedge parsley	annual	August - November
Asteraceae	*Arctotis incisa* botterblom	perennial	August - October
Asteraceae	*Berkheya armata* grootdissel	perennial	September - November
Asteraceae	*Corymbium africanum* plampers	perennial	October - November
Asteraceae	*Dimorphotheca pluvialis* reënblommetjie	annual	August - October
Asteraceae	*Felicia bergerana* astertjie	annual	August - October
Asteraceae	*Gorteria personata* klitskruid	annual	August - October
Asteraceae	*Othonna pinnata* bobbejankool	perennial	June - September
Asteraceae	*Ursinia anthemoides* magriet	annual	August - October
Boraginaceae	*Echiostachys incanus* bottelborsel	perennial	August - October
Brassicaceae	*Heliophila pusilla*	annual	August - October
Caryophyllaceae	*Cerastium capense* horingblom	annual	September - December
Crassulaceae	*Crassula glomerata* stonecrop	annual	August - November
Crassulaceae	*Crassula umbellata* stonecrop	annual	July - October
Droseraceae	*Drosera pauciflora* sundew, doublom	perennial	August - November
Geraniaceae	*Pelargonium pinnatum* stork's-bill, malva	geophyte / bulb	November - March
Geraniaceae	*Monsonia speciosa* sambreeltjie	perennial	August – November
Plantaginaceae	*Plantago cafra* Cape plantain	annual	August - September

Herbaceous Species ctd.

Family	Scientific Name Common Names	habit	flowering
Scrophulariaceae	*Diascia elongata* twinspur, horinkies	annual	August - October
Scrophulariaceae	*Diascia parviflora* twinspur, horinkies	annual	August - October
Scrophulariaceae	*Dischisma capitatum* false slugworth, basterslakblom	annual	August - September
Scrophulariaceae	*Hemimeris racemosa* geelgesiggie	annual	July - October
Scrophulariaceae	*Manulea cheiranthus* finger-phlox, vingertjies	annual	July - November

Bulb Species

Family	Scientific Name Common Names	habit	flowering	remarks
Amaryllidaceae	*Strumaria tenella* Cape snowflake, tolbol	geophyte / bulb	April - July	
Anthericaceae	*Chlorophytum rangei* grass lily	geophyte /	November - March	
Anthericaceae	*Chlorophytum undulatum* grass lily	geophyte / bulb	July - October	
Asphodelaceae	*Trachyandra flexifolia* Cape spinach, wildeblomkool	geophyte / bulb	May - September	
Asphodelaceae	*Trachyandra hirsuta* Cape spinach, wildeblomkool	geophyte / bulb	September - December	
Colchicaceae	*Androcymbium capense* cup and saucer, patrysblom	geophyte / bulb	June - August	
Colchicaceae	*Baeometra uniflora* beetle lily	geophyte / bulb	August - October	
Colchicaceae	*Onixotis punctata* hanekammetjie	geophyte / bulb	July - September	
Colchicaceae	*Wurmbea recurva* spike lily	geophyte / bulb	September - October	
Convallariaceae	*Eriospermum capense* cottonseed	geophyte / bulb	November - March	
Hyacinthaceae	*Albuca juncifolia* slime lily, slymlelie, tamarak	geophyte / bulb	September - October	
Hyacinthaceae	*Drimia exuviata* gifbol	geophyte / bulb	September - October	
Hyacinthaceae	*Lachenalia longibracteata* lachenalia, viooltjie	geophyte / bulb	July - September	
Hyacinthaceae	*Lachenalia orchioides* lachenalia, viooltjie	geophyte / bulb	August - October	
Hyacinthaceae	*Lachenalia pallida* lachenalia, viooltjie	geophyte / bulb	August - October	
Hyacinthaceae	*Lachenalia polyphylla* lachenalia, viooltjie	geophyte / bulb	September - October	
Hyacinthaceae	*Lachenalia pustulata* lachenalia, viooltjie	geophyte / bulb	August - October	
Hyacinthaceae	*Ornithogalum suaveolens* bonttjienk	geophyte / bulb	September - November	
Hyacinthaceae	*Ornithogalum thyrsoides* chincherinchee	geophyte / bulb	October - December	
Hypoxidaceae	*Spiloxene capensis* peacock flower, poublom	geophyte / bulb	July - October	
Hypoxidaceae	*Spiloxene flaccida* Cape star, sterretjie	geophyte / bulb	July - September	
Iridaceae	*Babiana ambigua* babiana, bobbejantjie	geophyte / bulb	August – September	
Iridaceae	*Babiana angustifolia* babiana, bobbejantjie	geophyte / bulb	August – September	

Bulbs ctd.

Family	Scientific Name Common Names	habit	flowering	remarks
Iridaceae	*Babiana odorata* babiana, bobbejantjie	geophyte / bulb	July – September	
Iridaceae	*Babiana secunda* babiana, bobbejantjie	geophyte / bulb	October – November	
Iridaceae	*Geissorhiza aspera* blou sysie	geophyte / bulb	August – September	
Iridaceae	*Gladiolus alatus* kalkoentjie, kipkippie	geophyte / bulb	August – September	
Iridaceae	*Gladiolus watsonius* rooi afrikaner	geophyte / bulb	August – September	
Iridaceae	*Hesperantha falcata* bontrokkie	geophyte / bulb	July – October	
Iridaceae	*Ixia erubescens* kleinagretjie	geophyte / bulb	August – September	
Iridaceae	*Ixia stricta*	geophyte / bulb	November – December	
Iridaceae	*Ixia flexuosa* waaikalossie	geophyte / bulb	August – September	
Iridaceae	*Ixia lutea*	geophyte / bulb	August – October	
Iridaceae	*Ixia patens*	geophyte / bulb	September – October	
Iridaceae	*Ixia longituba*	geophyte / bulb	September – October	
Iridaceae	*Ixia rapunculoides* bloukalossie	geophyte / bulb	August – September	
Iridaceae	*Lapeirousia azurea* cabong	geophyte / bulb	September – October	
Iridaceae	*Micranthus tubulosus* comb flower, vleiblommetjie	geophyte / bulb	November – December	
Iridaceae	*Moraea fugacissima* clock flower, horlosieblom	geophyte / bulb	July – September	
Iridaceae	*Moraea gawleri* uintjie	geophyte / bulb	July – October	
Iridaceae	*Moraea lewisiae* thread star, volstruisuintjie	geophyte / bulb	October – December	
Iridaceae	*Moraea villosa* blouflappie, uiltjie, peacock moraea	geophyte / bulb	August – September	
Iridaceae	*Romulea flava* geelknikkertjie, geelfroetang	geophyte / bulb	June – September	
Iridaceae	*Romulea rosea* rooiknikkertjie	geophyte / bulb	July – October	
Iridaceae	*Sparaxis villosa* Cape buttercup, sparaxis, fluweeltjie	geophyte / bulb	August - September	
Iridaceae	*Watsonia aletroides*	geophyte / bulb	September - October	

Bulbs ctd.

Family	Scientific Name Common Names	habit	flowering	remarks
Iridaceae	*Watsonia dubia*	geophyte / bulb	October - November	
Orchidaceae	*Disperis villosa* witch orchid	geophyte / bulb	August - September	
Orchidaceae	*Holothrix villosa* thread orchid, tryphia	geophyte / bulb	October - January	
Orchidaceae	*Pterygodium catholicum* bonnet orchid, moederkappie	geophyte / bulb	September - November	often after fire
Orchidaceae	*Satyrium erectum* geel trewwa	geophyte / bulb	July - October	
Oxalidaceae	*Oxalis commutata* sorrel, suring	geophyte / bulb	April - June	
Oxalidaceae	*Oxalis flava* bobbejansuring, vingersuring	geophyte / bulb	May - June	
Oxalidaceae	*Oxalis hirta* sorrel, suring	geophyte / bulb	April - June	
Oxalidaceae	*Oxalis obtusa* geeloogsuring	geophyte / bulb	June - October	
Oxalidaceae	*Oxalis pes-caprae* geelsuring	geophyte / bulb	June - October	
Oxalidaceae	*Oxalis polyphylla* vingersuring	geophyte / bulb	March - June	
Oxalidaceae	*Oxalis purpurea* sorrel, suring	geophyte / bulb	May - September	
Oxalidaceae	*Oxalis tomentosa* vingersuring	geophyte / bulb	April - June	
Oxalidaceae	*Oxalis versicolor* candycane sorrel	geophyte / bulb	May - November	
Tecophilaeaceae	*Cyanella hyacinthoides* blouraaptol	geophyte / bulb	August - November	
Tecophilaeaceae	*Cyanella lutea* geelraaptol	geophyte / bulb	September - October	

Appendix B: Useful contacts

Renosterveld Research & Restoration:

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Seed Room, Kirstenbosch National Botanical Garden

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email:seedroom@nbi.ac.za
http://www.nbi.ac.za/products/seeds.htm

AGRICOL Seed Co (Pty) Ltd

Paarl Rd
Brackenfell 7560
Tel: (021) 981 1126

Appendix C: Further Reading

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Winter, S.J. (2003): *Attitudes and behaviour of landholders towards the conservation of Overberg coastal renosterveld, a threatened vegetation type in the Cape floral kingdom*. Unpublished MSc thesis, University of Stellenbosch.

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Appendix D: Glossary

Biodiversity: All genes, populations, species and ecological communities in a system, and the ecological and evolutionary processes sustaining them.

Biodiversity Hot Spot: An area (e.g. the Cape Floristic Region) with a high plant and animal species diversity and a high degree of endemism, which is under severe threat.

Biome: major communities, classified according to the predominant vegetation. Species within a biome sharing adaptations and characteristics.

Cape Floristic Region: the biogeographical region on the southwestern tip of South Africa, where species share common characteristics and adaptations. The Cape Floristic region is the smallest of the six floral regions, but the most species-rich.

Corridor (see also **Stepping Stone)**: a strip of natural vegetation linking habitat fragments. Corridors and stepping stones facilitate movement of species between fragments.

Ecological process: An ecological process is a process that assists in maintaining and shaping an ecosystem or plant or animal community. Ecological processes are for example fire, seed dispersal, predation, nutrient influx, etc…. Ecological processes operate in short time scales.

Ecosystem service: a benefit that is derived from an ecological process, or functioning ecosystem. For example, clean water obtained from the mountains is an ecosystem services, as is the pollination of crops by insects living in vegetation remnants.

Ecotypes: a variant of a (plant) species that is adapted to specific local conditions.

Edemism: A plant or animal is considered endemic when its distribution is restricted to a specific geographical region. Species can be endemic to continents, subcontinents, countries, mountain ranges, etc…

Evolutionary Process: An evolutionary process assists in maintaining the potential for the further evolution of a species. These processes include genetic exchange between populations of one species, dispersal, …. Evolutionary processes function over long time scales.

Floral Region (Plant Kingdom, Floral Realm): A biogeographic region where plants share similar characteristics and endemism is high

Fragment (remnant): A piece of natural vegetation or habitat surrounded by a different vegetation or habitat (**Matrix**), or agricultural and urban areas, and is thus isolated from similar vegetation or habitat.

Fynbos Biome: a biome at the south-western tip of South Africa, consisting of two major plant communities sharing common adaptations and characteristics - fynbos and renosterveld.

Indicator: a species that reacts quickly to changes in ecosystem, and can thus be used as a pointer or gauge for a process or state of an ecosystem.

Invader (Invasive Species): a species that is not native to an ecosystem, which is able to establish in an ecosystem and which is able to damage the ecosystem by e.g. changing ecological processes.

Matrix: the vegetation or habitat surrounding isolated vegetation patches.

Stepping stones (see also **Corridor)**: a series of small to very small vegetation remnants linking larger habitat fragments. Corridors and stepping stones facilitate movement of species between fragments.

State and Transition Model: a graphical representation of changes within a vegetation type. States symbolize the various stages of the vegetation (e.g. grass dominated, shrub dominated), while transitions are used to described the factors and processes leading to changes from one vegetation stage to another.

Succession: a directional, non-seasonal change in plant and animal communities

Transformation: change or loss of natural habitat. Natural habitat can be transformed into agricultural or urban areas, or be transformed by overuse, e.g. overgrazing or deforestation.

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