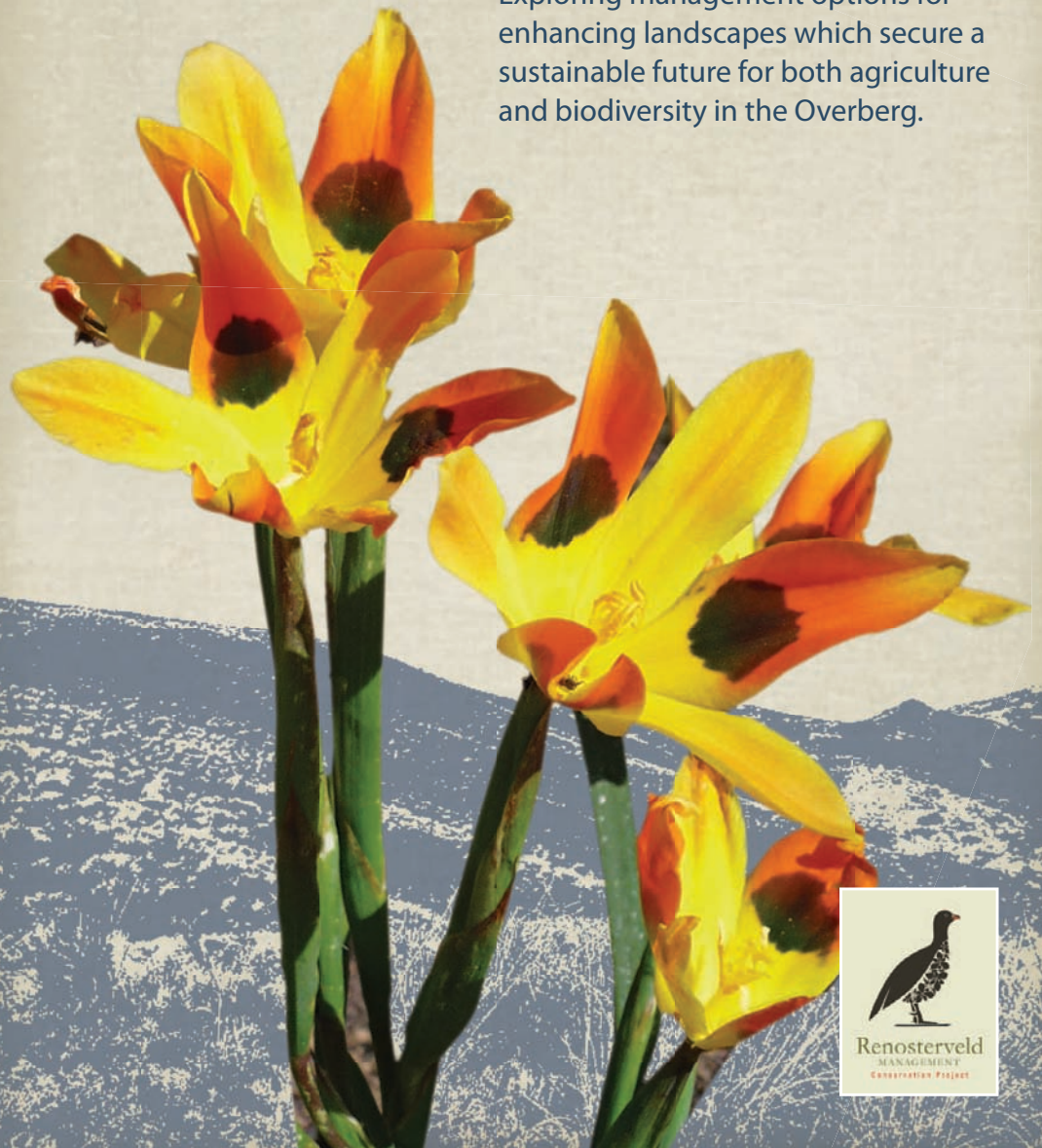
THE RENOSTERVELD MANAGEMENT& CONSERVATION PROJECT

Exploring management options for enhancing landscapes which secure a sustainable future for both agriculture and biodiversity in the Overberg.



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Renosterveld MANAGEMENT Conservation Project

What is Lowland Renosterveld?

Lowland Renosterveld is the relatively fertile, clay-based veld type that occurs in the low-lying areas of the Western Cape. Renosterveld is part of the Fynbos Biome, although it is very distinct from Fynbos – the main difference being that it generally lacks, with some exceptions, the three distinctly fynbos elements: the proteas, ericas (heather) and restios (reeds).

The largest area of remnant renosterveld left in the Overberg lies between Bredasdorp and Swellendam.

It is one of the richest ecosystems in the world, due to its extraordinary bulb diversity. However, the renosterveld we see today may be very different from what it was >300 years ago: before the advent of large-scale commercial agriculture in the Western Cape, renosterveld supported large numbers of big game (including Black Rhino, Eland and the now extinct Bluebuck) and was probably a far more grassy system (with some areas even having a very high Rooigras *Themeda triandra* component), with a much higher diversity of shrubs and bulbs. The combination of grazing (grass-eating) and browsing game animals of varying sizes maintained the diversity and structure of this system. Sadly, the replacement of large game animals with small, selective feeders (cattle and sheep), combined with years of poorly—informed management (i.e. over-grazing and too little or too much burning), has allowed this special veld to become severely degraded and dominated by 'unwanted' shrubs, such as renosterbos *Elytropappus rhinocerotis*. Today, those areas that are well-managed retain the characteristics of renosterveld and it is clear that this habitat supports a diversity of botanical gems, incomparable with any other system in the world.

Why the concern over its conservation status?

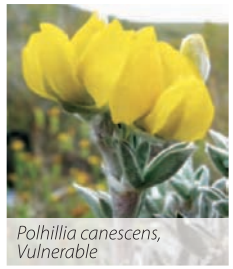
Because of the fertile nature of lowland renosterveld, it has been exploited for agriculture – with the result that it is now a severely transformed and fragmented system (i.e. it has been ploughed and broken into lots of small, isolated pieces). It is considered a *Critically Endangered* veld type, with <4-6% remaining throughout its original range. Almost all remaining renosterveld is on private land – thus the future of renosterveld lies in the hands of each individual landowner.

Key threats to renosterveld

- Incorrect use of fire: too little fire, too much fire or burning at an inappropriate time
- Incorrect use of grazing or overgrazing
- Lack of sufficient rest for the veld after a burn
- Fragmentation effects, including edge effects and associated extinction risks
- (Illegal) cultivation of virgin land

Special plants and Red Data lists

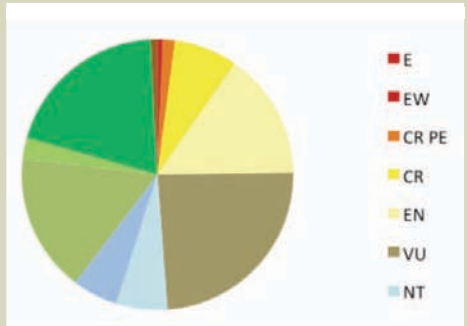
The IUCN (International Union for the Conservation of Nature and Natural Resources), which is the world's authority on the conservation status of species developed the first Red Data lists in 1948. These lists are the most comprehensive inventory of the world's threatened plants and animal species. Go to http://www.iucnredlist.org/ for more information.



Polhillia canescens, Vulnerable

Gladiolus acuminatus, Endangered

Recently, a group of expert botanists compiled the **Red List of South African plants:** a book which assesses the conservation status of ALL the plants in South Africa – an incredible 20 456 species, of which 13 265 are endemic (i.e. only found in SA). Thus, every plant in the entire country's plant kingdom has been classified according to its threat status. In addition to categorizing plants into their Red Data Category, the book also describes the reasons for population decline and current threats to the species.



Breakdown of threat status of all threatened plant species in the Western Cape (adapted from Raimondo & von Staden 2009).

The Red Data Listing for SPECIES works on the following categories (from most- to least-threatened):

Extinct (EX): No doubt that the last individual has died. **Extinct in the Wild (EW):** No doubt that the last wild individual has died, but it is known to survive in cultivation, or in an area outside its natural range. **Critically Endangered and Possibly Extinct (CRPE), Critically Endangered (CR), Endangered (E), and Vulnerable (V):** In order to determine which of these categories a species fits into, a combination of five key criteria (which influence extinction risk) are analyzed. These factors include: i) the extent of population decline, ii) small geographic range or highly fragmented population, iii) small population size & decline, iv) very small population size or very restricted distribution and v) probability of extinction over a specified period of time. **Near-Threatenend (NT):** Does not yet qualify for any of the above categories, may become threatened in the near future. **Least Concern (LC):** These species are not currently at any known risk of extinction. **Data Defficient** insufficient information **(DDD):** There is not enough known about the threats facing these species. **Data Defficient** taxonomically uncertain **(DDT):** Species that are poorly understood in terms of, for example, whether or not it is a separate species or a sub-species. **Critically Rare, Rare, Declining:** Naturally rare species (e.g. species with very restricted ranges) which require close monitoring. **Declining:** Population trends suggest a decline, close monitoring required.

Go to www.redlist.sanbi.org for more information

The Red Listing for VELD TYPES is based on very similar categories and takes into account the percentage of the original extent remaining, as well as current threats to the system. These threat categories are determined by the Department of Environmental Affairs (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).

For more information:
www.info.gov.za/acts/2004/a10-04/

Relevance of red data lists to renosterveld

In the Overberg, there are four different types of renosterveld: Western-, Central- and Eastern-Rûens Shale Renosterveld and Rûens Silcrete Renosterveld – and all are categorised as *Critically Endangered*. Renosterveld contains many endemic species, which are naturally rare and have highly restricted ranges. Some of these species are so specialized that they are only found in certain microhabitats, within a certain renosterveld type. For example, Gibbaeum haaglenii is an Endangered succulent which only occurs on quartz koppies in Eastern Rûens Shale Renosterveld and Gladiolus acuminatus is an Endangered bulb which only occurs on north and northwest renosterveld slopes between Caledon and Bredasdorp. Therefore, a small amount of habitat loss can be detrimental for many of these rare and specialized plants. It follows that habitat losses of 80% and more have resulted in many renosterveld species falling into the higher threat categories. We are dealing with extraordinarily fragile systems that need to be carefully managed and protected if future generations are to enjoy their hidden treasures.

Gibbaeum haaglenii, Endangered

An island of renosterveld surrounded by a sea of agriculture.

Fragmentation: because renosterveld has been so fragmented (cut up into small patches), it is subject to a suite of threats to which it would otherwise not have been exposed. For example, fertilizer, pesticide and herbicide run-off lead to what is known as **'edge effects'**, which can result in invasion by alien grasses, thistles and weeds, a decrease in pollinators and an overall decline in the viability of a patch. The extinction of processes may eventually result in the extinction of species and the veld type as a functioning system. This effect can potentially be halted through the conservation of extensive areas of remnant renosterveld, while encouraging corridor formation between isolated fragments (through restoration on old lands and watercourses), to enable animal movement across the landscape (this includes insects, birds and mammals). Conservation of ecological processes is the key to healthy, living **landscapes**, which include arable lands and natural veld.

Small fragments are constantly threatened by edge effects.

THE RENOSTERVELD RESEARCH PROJECT

This project focuses on Overberg renosterveld and aims to determine how remnants should be managed in a way that will secure the long-term viability of the renosterveld ecosystem. Knowledge will enable landowners, conservation managers and extension staff to make better decisions about managing renosterveld, with benefits for both agriculture (grazing value, erosion control, water management) and conservation (biodiversity & ecological functioning).

The main focus of the research project was to carry out experimental studies to examine the effects of fire and grazing on renosterveld. Plots have been set up on six sites in the Overberg (2007), where ecological burns were carried out in autumn 2008, so that we could monitor the veld before and after burning. Half the plots are 'exclosure' plots, which are fully-fenced to prevent any animals from grazing the plot. The other half are 'control' plots, which allow grazers (mostly livestock) access to the plots, so that we can compare the recovery of grazed and ungrazed plots after a fire. The grazing exclosure and control plots were set up in a burned and unburned area for each site. This was repeated on a north- and a south-facing slope. Thus, this experimental design enabled us to compa re the following: burned-grazed vs. burned-ungrazed vs. unburned-grazed vs. burned ungrazed on both north- and south-facing slopes.

In addition to experimental plots, 42 random, 10x10 m plots, restricted to a 16km radius near Napier on both north- and south-facing slopes were sampled in spring 2010.

The following broad questions were asked

- Is managing renosterveld for agricultural benefit compatible with managing for conservation (i.e. overall biodiversity) objectives? •How do we use fire and grazing, as effective management tools – i.e. what are the best strategies for Overberg Renosterveld?
- What are the 'ideal' management strategies that need to be applied to renosterveld in the Overberg, in order to have maximum potential for 1) conservation, 2) agriculture, and 3) both these objectives simultaneously?

Definitions

Fragmentation = the breaking up of the natural landscape into patches (fragments) of natural veld through land transformation.
Annual = a plant that completes its life-cycle within a single growing season (commonly known as 'opslag').
Forb = an herbaceous, perennial shrub (essentially softer plants than the large woody shrubs).
Perennial = a plant that lives for more than two seasons.
Geophyte = bulb ('bolplant').
Woody shrub = larger, woody perennial bushes (bossies)
Indicator = a species whose presence may represent certain environmental conditions (e.g. a particular species may be associated with high species ric hness or may be an indicator of very old veld).
Veld age = time since the veld last burned.
Reseeder = a plant which depends on the production and germination of seeds to reproduce after a disturbance event (such as fire). These plants are not capable of resprouting.
Resprouter = a plant which is able to survive disturbance events, such as fire, by shooting new growth from its main stem or branches. These plants are often poor seeders.
Asteraceous shrubs = shrubs belonging to the 'daisy' family, which include Renosterbos, Kooigoed, Kraalbos, etc.).
Grazer = an animal that only grazes on grass.
Browser = an animal that browses on shrubs and trees.
Disturbance = natural or man-induced disturbances to ecosystems, such as fire, grazing, trampling, etc.

RESEARCH RESULTS

Although further long-term monitoring is required to answer some of the questions we are grappling with, the following is a summary of the preliminary results from the research and what they mean for renosterveld management.

Fire and renosterveld

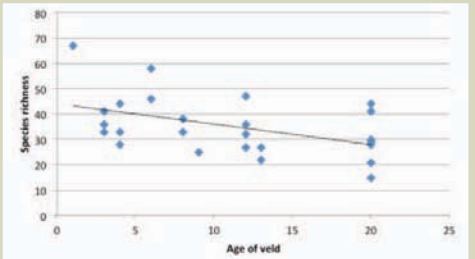
Essentially, forbs, annuals, grasses and geophytes increased notably in the first season post-fire and / or were more abundant in younger or shorter vegetation. In contrast, woody shrubs and succulents were significantly reduced by fire and were more abundant in older or taller veld.

Overall, productivity in renosterveld appears to be linked to time-since-burn: **younger veld is generally more productive, with a higher species richness.** It appears that renosterveld is not only tolerant of fire, but that it responds positively to burning. However, whether this trend is influenced by the fire itself (i.e. whether certain plants require fire and/or smoke to germinate), or whether this is merely a response to the open space, reduced competition and available light as a result of fire, is unclear at this stage and requires further investigation. Field observations of recently-burned veld suggest that certainly, there is a far higher rate of seedling establishment and new growth in burned veld when compared with unburned veld.

It has also been speculated that renosterveld is adapted to higher fire frequencies than fynbos, as it contains very few slow-growing, reseeding species, which require long fire intervals to remain in the system. Our data suggest that certainly a three-four year cycle will be too short and will alter the system completely. However, it also appears that renosterveld is likely to cope with burning frequencies on the lower end of the scale recommended for Fynbos – i.e. recommendations for Fynbos vary from 8-15 years and renosterveld may tolerate seven/eight-year burning cycles. While at this stage, we are willing to concede that renosterveld may well be adapted to higher burning frequencies, we recommend the cautionary principle be adopted here, until several years of additional experimental plot data have been collected.

Bulbs such as this Moraea bituminosa respond positively to fire.

New life for many species during the first spring after a fire.



The negative relationship between veld age (i.e. time since last burn) and species diversity on north-facing slopes. The pattern was similar for south-facing slopes. This suggests that taller (i.e. older) veld on contains lower species diversity than younger, more recently burned vegetation.

Grazing and renosterveld

Plants in grazed plots are shorter, smaller (in terms of crown canopy diameter) and less likely to produce flowers than their counterparts in ungrazed plots. Thus, although species diversity and overall cover in grazed plots did not appear to differ from those in ungrazed plots initially, a closer examination of effects on the individual plants which were evidently grazed, revealed that grazing impacts may initially be quite subtle.

Renosterveld was grazed by many large game species historically and therefore, is adapted to grazing and browsing, as is also evident from the higher proportion of palatable grasses and resprouting shrubs, when compared with Fynbos. However, game herds would have used the veld in a different manner to the way in which livestock do today: game herds would have moved through the landscape, in a nomadic fashion, spending only a few days at a time on an area, before moving off in search of 'greener pastures.' Thus, renosterveld is unlikely to be adapted to continuous and heavy grazing. The fact that grazing reduces plant height, overall size and probability of flowering suggests that overgrazing will have significant negative effects on productivity in renosterveld in the long-term. We therefore caution against the regular and continuous use of renosterveld for grazing, particularly during the critical growth and flowering periods (i.e. winter and spring), as this is likely to have detrimental effects on these groups and therefore, overall habitat quality.

Livestock (sheep and cattle in this case), which are highly selective grazers, cannot be considered a complete surrogate for the diversity of grazers and browsers which inhabited the lowlands of the region historically. However, today, these animals are the only available large herbivores that can be managed in an attempt to mimic the required grazing in renosterveld. What complicates the effects of current-day grazing are the threats associated with fragmentation. The ecological integrity of patches is compromised by many factors, including edge effects e.g. activities in adjacent productive lands (e.g. herbicide / fertilizer / pesticide use), disturbance effects, climate change, loss of pollinators, etc. Thus, incorrectly-timed grazing or over-grazing by livestock will exacerbate these influences. Also, while antelope were likely to have foraged in a nomadic way, livestock tend to aggregate in particular favoured spots and forage on favoured species, which can lead to over-trampling and over-exploitation of palatable species (reducing their productivity and leading to an increase in unpalatable ('unwanted') species and a reduction in overall diversity).

Identifying indicator species

Identifying indicator species within renosterveld is challenging, as it is a very heterogeneous system at both the landscape- and patch-level. The only useful groups or species that we could identify were common and widespread across renosterveld. It appears that, as expected, a dominance by Asteraceaous shrubs (including Renosterbos) or *Merxmeullera* and *Pentachistis* species (a dominant, unpalatable, grass, known as 'polgras') is associated with older veld and lower species diversity, and therefore, dominance by these plants could be considered an indication of when it is 'ecologically safe' to burn. On south-facing slopes, an increase in Renosterbos leads to a decrease in Rooigras and *Ehrharta* (important palatable grasses): thus the point at which these palatable grasses are significantly lost from the system may also be an indication of readiness to burn.

On south slopes, *Ehrharta calycina* was associated with higher species richness and therefore, is likely to be a useful indicator of 'healthy' renosterveld found on these cool, moist slopes. In contrast, on north slopes, Cymbopogon sp., a grass commonly known as Turpentine grass, is associated with higher species richness and is thus may be a useful indicator of 'healthy' renosterveld on dry north- and west-facing slopes.

Sebaea exacoides (an annual) benefits from fire.

Ehrharta calycina may be a useful indicator in renosterveld.

It is tempting to infer that managing for favourable perennial grasses, through more regular burning, will maintain high levels of biodiversity. However, one must treat this assumption with caution, as regular burning is likely to favour grasses, annuals and geophytes, at the expense of slower-maturing shrubs.

An abundance of *Ehrharta calycina* was associated with overall species diversity on south-facing slopes. This suggests that this species may be a good indicator of 'healthy' renosterveld.

Nemesia barbata is one of several spectacular annuals that benefit significantly from fire.

Differences between sites and aspects

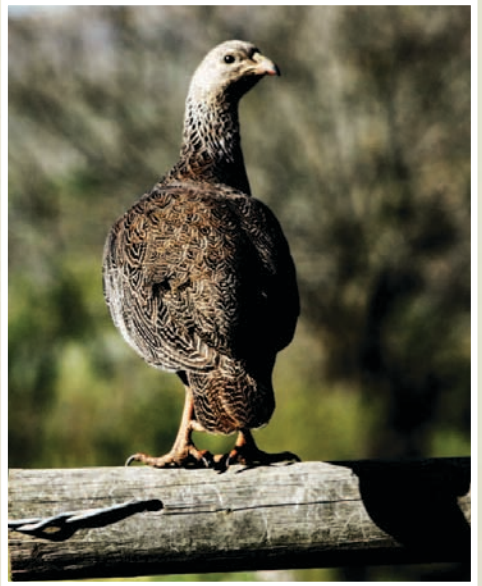
The experimental plots have emphasized that managers cannot stick to a uniform set of management guidelines for all renosterveld habitat types, as these veld types are far too variable within and between patches, between different veld types, soil types, rainfall regimes and aspect. The differences in plant community structure and the responses of communities on north- and south-facing slopes also suggest that management needs to consider the impacts on both these slopes. North-facing slopes are likely to be less tolerant of disturbance (grazing and fire) than are their wetter, cooler counterparts. We do not recommend that they are managed separately (as this would involve internal fencing, which is not ideal), but rather we suggest using the condition of north-facing slopes as an indicator for the condition of the patch as a whole, as a means of exercising precaution against over-exploiting fragments.

Obtaining the required burning permits
Difficulties with obtaining the necessary burning permit is a serious hindrance to landowners who want to burn their veld. The 'safe' season to burn (according to local fire departments) is generally winter and spring, while ecologically, the best time to burn is autumn (when the veld is driest and contains the highest fuel load). However, by working together with CapeNature and Working on Fire, providing a detailed burn plan, and presenting an inventory of equipment available (bakkies, bakkie-sakkies, drip torches, labour, beaters, etc.), as well as a commitment from neighouring farmers to support and assist with burning, we were able to put a strong case forward to the relevant fire boss and obtain permission to burn in March/April. We suggest this kind of approach is used by landowners who wish to burn in future.

Conclusions from research findings

At this stage, it is difficult to speculate on appropriate fire frequencies. However, the data from experimental plots clearly indicate that burning veld under three years old would not be beneficial to overall diversity. The veld at this stage is still unstable. Only further monitoring of the experimental plots will reveal at what stage it would be appropriate to burn again.

With time, the experimental plots will provide more useful data for making decisions about long-term management plans. However, some interesting and useful lessons have been learned from this research and these can certainly assist with current management decisions. Management challenges need to be addressed through a cooperative process with landowners to determine a way forward. We need to find a way to work together with the people who are effectively the custodians of this threatened system to determine a means through which we can manage landscapes for both agriculture and ecological functioning, which surely must work hand-in-hand, if either one is to be sustained.



General 'ideal' guidelines for renosterveld management

The following is a summary of renosterveld management guidelines. These are guidelines only and it is understood that changing management regimes is not always immediately practical and affordable. However, if one manages the veld correctly as much of the time as possible, one is more likely to reap ecosystem services from it than if one simply neglects it.

- Burn in autumn (this favours palatable grasses and bulbs, while summer burning favours unwanted species, such as Renosterbos).
- Do not burn too frequently: every 7-12 years or so is probably ok, although we know very little about this, so rather be safe than sorry! Burning frequencies will obviously vary depending on the type of veld and rainfall (with higher rainfall areas being more tolerant of higher burning frequencies).
- NEVER graze immediately after a fire, but rather rest the veld for 18 - 24 months before grazing (and then do so only in the late summer months, for a short period). Resting allows all species an equal opportunity to rejuvenate after fire and therefore, promotes the growth of favourable species, such as Rooigras. Grazing too soon after a fire will promote unfavourable species, at the expense of favourable ones, causing the veld to be dominated by unwanted plants. Thus, correct management promotes the more favourable species, so that in the long term, grazing quality and quantity is higher.
- Where possible, avoid feeding animals in the veld, as 1) these areas tend to get excessively trampled and fertilized and 2) this often results in alien grasses, weeds and thistles moving into the area.
- Overgrazing usually arises from the fact that renosterveld is seldom managed as a separate camp, thus it is subjected to whatever land-use is being applied on the adjacent arable lands. This results in the veld being rested appropriately while adjacent to a grain crop, but often severely overgrazed when it is part of a lucerne camp for several consecutive years. Ideally, fragments should be fenced, or temporarily fenced (i.e. using electric fencing) in order to facilitate more appropriate grazing regimes. This is often too costly and not practical, but is probably the most effective way of ensuring the long-term viability of renosterveld.
- A dominance of Renosterbos is believed to be a sign of either overgrazing, lack of fire (old veld), or both. If the veld is senescent and / or has been overgrazed in the past, sometimes the solution is to burn. But again, the most important thing here is to REST the veld after the burn. If the veld has been heavily grazed, it is also a good idea to rest it before attempting to burn it, so that it can build up enough of a fuel load for a successful burn.
- Current knowledge suggests that grazing should only take place between late November and early March (as this promotes bulbs and palatable grasses) i.e. the Golden Rule is: No livestock in the renosterveld camps from winter to late spring. Rather, use renosterveld camps as reserve food sources in the summer. Where landowners are left with no choice but to use renosterveld for grazing, due to, for example, a winter drought, it is evident that veld which is managed appropriately the rest of the time will be far more resilient to this once-off exception in grazing regimes than it would be if it were continually grazed throughout the rest of the year.
- Because area-specific knowledge in this field is lacking, constant monitoring of the veld for signs of overgrazing is essential. Pay attention to what species the animals are targeting and monitor these. If these plants are reduced significantly in size and height and are prevented from flowering, it would be best to remove the livestock and rest the veld until these 'indicator species' recover.

Changing attitudes

The most rewarding aspect of this project has been working with landowners and seeing attitudes shift from 'why should I care about this veld?' to 'that which was worthless and had no value has suddenly got priority and status.'

Other comments include, "I am now aware of the urgent need to protect renosterveld. I also now see more potential in what was previously only barren, useless land to me," and 'I definitely understand a lot more about this veld type which I have been ignoring for 20 years. I discovered species on my farm which I did not even know existed!'

Many landowners have realised that THEY are the custodians of this veld type, that ALL of it is in their hands, and that they have the power to determine whether or not renosterveld survives into the future

> "For 200 years we've been conquering Nature. Now we're beating it to death."
>
> *Tom McMillan, Politician & farmer*

Most landowners are unaware of the botanical gems hidden in their 'uitvalgrond', but once they are shown these and have understood the significance of owning rare and endangered systems, they have gone from being disinterested or resentful towards the veld to feeling proud of their renosterveld and have even demonstrated a genuine willingness to change their management to favour the long-term integrity of the veld. Try to spend time in your veld and get to know it and if you are interested in learning more, join the Renosterveld Working Group – we will also visit your farm!

Options for restoration and rehabilitation

Currently, very little is known about how to rehabilitate previously ploughed lands and 'bring back renosterveld.' Observations suggest that this is a very complicated and expensive procedure. It is clear that ploughed renosterveld will not restore itself for many generations – if at all. Surveys in old lands have demonstrated that although much of the structure may come back, the diversity does not return and is unlikely to do so within our lifetime, or even that of our children's children. This emphasizes the importance of maintaining the natural veld that is still intact – it is certainly a more productive and cheaper option than trying to bring the veld back post-ploughing.

However, because of the Carbon crisis that we are in, a lot of research is currently focusing on the possibilities of using renosterveld restoration as a means for Carbon sequestration. This research is still in its infancy, but may reveal exciting options for alternative land-use on C-grade lands which are no longer suitable for grain or fodder crops. From a biodiversity perspective, restoration will be most useful where it can assist with the creation of corridors which link renosterveld fragments together and so enable the conservation of natural processes.

A bee visits a Moraea elegans, Endangered. Pollinators are one of the most valuable ecosystem services provided by renosterveld.

PLOUGHING OF VIRGIN LAND: WHAT DOES THE LAW SAY AND WHY

Unfortunately, illegal ploughing of virgin land remains a significant threat to renosterveld and other threatened veld types.

Unfortunately, illegal ploughing of virgin land remains a significant threat to renosterveld and other threatened veld types. We would therefore like to highlight the laws dictating the terms on which virgin land may or may not be ploughed, as many landowners are not aware of these laws. These have not been put in place to make farming more difficult for landowners, as so many people incorrectly believe. They are there to protect our natural agricultural resources, in order to maintain healthy, living landscapes, where farming can continue successfully for many more generations. Healthy ecosystems are the basis for productive farms. They provide **Ecosystem Services**, in the form of natural drainage (intact vegetation in wetlands and watercourses), pollination services, erosion control (intact vegetation assists with preventing erosion in gullies and on steep slopes), while natural grazing and shelter is provided by well-managed veld. Thus, one needs to imagine what a landscape without this 'free' assistance from nature would be like and to ensure that farms are managed for the well-being of all habitats (cultivated and natural) on the farm.

"Once species become extinct, no corrective legislation can bring them back-they are gone forever."

Allen M. Solomon, Plant & paleo-ecologist

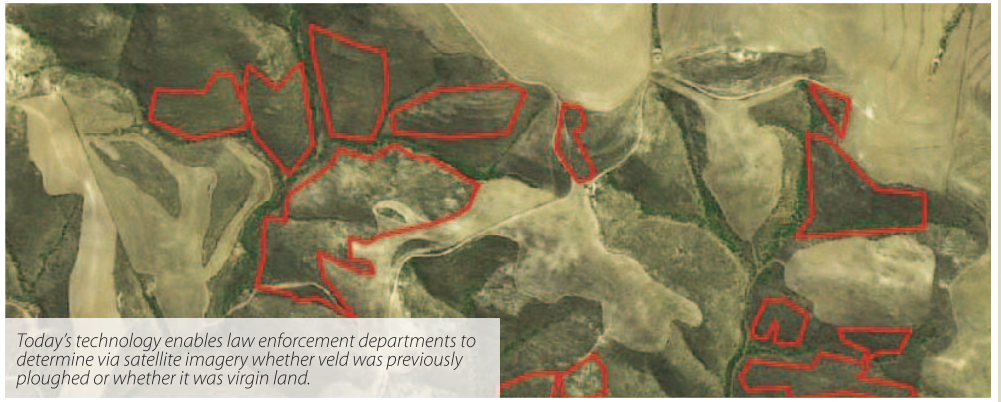
The effects of constant overgrazing may result in irreversible damage to the veld and significant species losses.

Two laws are currently in place to control the cultivation of virgin soil & management of natural resources: NEMA (National Environmental Management Act) and CARA (Conservation of Agricultural Resources Act). Both clearly state that it is **illegal to plough virgin land or land that has not been cultivated within the last 10 years without the necessary permit.** It is a criminal offence to plough virgin land and is punishable by law (jail sentence and/or up to R5 million fine and a criminal record).

NEMA: National Environmental Management Act
NEMA states that before any listed development activities can be undertaken, an EIA (Environmental Impact Assessment) must be undertaken and an Environmental Authorization obtained. Listed activities include the cultivation of virgin land, particularly with regards Critically Endangered or Endangered ecosystems. This also includes i) transformation or removal of indigenous vegetation on land that was transformed more than 10 years ago, ii) any phased transformation or removal of indigenous vegetation, iii) removal or transformation of indigenous vegetation with, for example, a bulldozer or brushcutter to create firebreaks and iv) removal or transformation of indigenous vegetation to create roads or tracks. The authority responsible for implementing NEMA is DEA&DP (Department of Environmental Affairs and Development Planning).

The image below shows that **satellite photography** is available to us through GIS systems and Google Earth which means that every piece of land can be watched from the sky. These images show the difference between virgin land and ploughed lands very clearly. **Thus plough sites can be mapped and checked against a time-series created from satellite imagery.**

CARA: the Conservation of Agricultural Resources Act CARA also forbids any cultivation of virgin soil without the necessary permission. It also forbids the misuse of fire and grazing, when these are detrimental to the veld. CARA defines cultivation as 'any act by means of which the topsoil is disturbed mechanically,' while virgin soil is 'land that has at no time during the preceding 10 years been cultivated.'



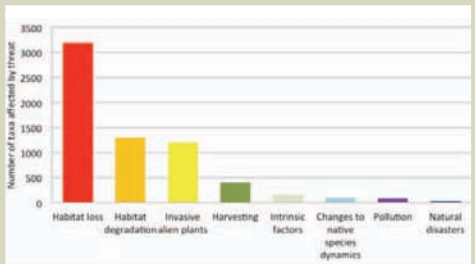
Today's technology enables law enforcement departments to determine via satellite imagery whether veld was previously ploughed or whether it was virgin land.

The following is a summary of the CARA regulations with regards virgin land:

That, without the necessary written permission: 1) no land user may cultivate any virgin soil; 2) no land user may cultivate any land with a slope of more than 12%; 3) every land user must protect cultivated land effectively against water– and wind-erosion; 4) no land user may utilize the vegetation in a vlei, marsh or water sponge or within the flood area of a water course (in a manner that may cause the deterioration or damage to the natural agricultural resources); 5) no land may be cultivated within 10 m horizontally outside the flood area of a water course; 6) the grazing capacity of the veld, expressed as a specified number of hectares per large stock unit, may not be exceeded, unless the veld is sufficiently protected against deterioration and destruction; and 7) no land user may burn any veld, or utilize as grazing, any veld on his farm unit that has burned.

Information taken from 'CARA Legislation made easy, The Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983) (CARA)'

For more information contact : 021 9768136 or visit www.nda.agric.za/docs/landcare/landcare.htm



The relative threats to plants in South Africa. Habitat loss comprises mostly crop cultivation (46%) and urban and coastal development (27%), while habitat degradation comprises mostly overgrazing (52%) and deleterious fire regimes (37%) (adapted from Raimondo & von Staden 2009).

"So bleak is the picture... that the bulldozer and not the atomic bomb may turn out to be the most destructive invention of the 20th century."

Philip Shabecoff, Journalist

WHERE TO FROM HERE

The research aspects of this project will be continued, as only long-term data can provide us with a true understanding of renosterveld ecology.

A beautiful spring show of Drosanthemums following an autumn burn.

We will also be conducting Carbon-isotope analyses on soil samples to investigate the historic distribution of C4 grasses (such as Rooigras) vs. that of C3 grasses (Polgras) and shrubs (e.g. Renosterbos), as a means of assessing what the veld looked like historically. This will help us address the controversial question: 'what sort of habitat structure should we be managing towards: a grassy-shrubland or a shrubby-grassland?'

We hope to grow and strengthen the Renosterveld Working Group and would like to encourage as many landowners and other interested individuals in the Overberg to join this group and take part in our annual outings. Let's find a way to work together to make healthy landscapes for farming and conservation!

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For furthure information

Project manager: Odette Curtis
Tel: 083 551 3341
E-mail: odette@orcawireless.co.za

For updates on the research project and activities of the Renosterveld Working Group, please visit **www.renosterveldmanagement.com**