

PRACTICAL SOIL EROSION CONTROL AND VELD REHABILITATION IN THE LITTLE KAROO

**PREPARED FOR LANDOWNERS AND MANAGERS
BY THE BIODIVERSITY PROJECT OF THE OSTRICH
INDUSTRY BUSINESS CHAMBER**

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CONTENTS

1. Introduction	1
2. Hollows or pits	2
3. Erosion control fences	4
4. Treating foot paths	6
5. Reshaping dongas	8
6. Combining treatments	10
7. Using stone gabions	12
8. Establishing plants	14
9. Maintenance is critical	15
10. Man power	17
11. Materials	18
12. Bibliography	19
13. Sponsors	20

1. INTRODUCTION

This booklet is a small part of the efforts of the Biodiversity Unit of the South African Ostrich Business Chamber (SAOBC) to improve the state of biodiversity in the lands farmed with ostriches in the Little Karoo.

In this booklet, the methods that were experimentally used in 2009 to rehabilitate some of the degraded parts of ostrich farmland in the Oudtshoorn district, are described in detail and some of the good results achieved are shown.

The first step in the rehabilitation process is to eliminate the cause of the veld degradation. If the cause is historical overgrazing, then all that is required is to exclude rehabilitation sites from grazing until the protective vegetation cover is well established. This may require a number of growing seasons, a realistic period of no less than three years with normal rainfall.

The methods used are easy to implement using unskilled but carefully supervised workers. The cost of implementation was a major consideration and the methods show the minimum of effort and costs required for the effective rehabilitation of degraded veld.

It is important to appreciate that habitat rehabilitation in the extreme climate of the Little Karoo is difficult and the methods shown focus on the creation of a micro-climate that will give germinating plants on the treated sites the best chance for survival.

Another important aspect of rehabilitation work, which is most often neglected, is the follow-up maintenance of rehabilitation efforts. After installation, the erosion control structures need constant attention (particularly after rainfall) to ensure that they are still effective and that they will continue to contribute to veld improvement.

This booklet will hopefully help the landowner (or manager) to identify sites in need of attention and provide the practical methods that can be used for each type of soil erosion.

As with all kinds of field practice, the methods described can be modified to accommodate a particular site or condition, but it is critical that the basic principles, as described for each method, are used as a guide. There are many additional methods that could be used to control soil erosion, but the methods described have been tested, and have proved suitable for typical local conditions.

Practical examples of the methods used can be viewed at four sites near to Oudtshoorn. Arrangements to do so can be made with the Biodiversity Unit of the SAOBC.

2. HOLLOWES OR PITS

Hollows are simple and cheap to make, they can completely transform bare capped soil and they help to rehydrate aridified soil.



Before: Bare capped soil
impervious to water



After: Hollows vegetated and
rehydrating arid soil.

IMPORTANT PRINCIPLES AND GUIDELINES:

- ❖ Slows runoff water flow across flat, sheet-eroded areas.
- ❖ Not suitable for use on slopes.
- ❖ Rooted plants should not be disturbed.
- ❖ Livestock and game must be removed or excluded to eliminate grazing.
- ❖ Mulching and seeding will speed up the recovery rate.

WHY USE HOLLOWES?

- ❖ They facilitate water infiltration on bare capped soil surfaces where very little rain water infiltrates the soil surface.
- ❖ Each hollow traps \pm 50 liters of water - 500 hollows will thus trap 25 000 liters of water - all of which goes into the soil.
- ❖ Hollows also trap windblown plant litter and seeds.
- ❖ Each hollow develops a fertile microclimate and becomes a seed production site.
- ❖ Hollows are cheap and very easy to prepare by hand.



1. Hollows ($\pm 500 \times 500 \text{m} \times 200 \text{mm}$ deep) made across the bare area.



2. Mulching the hollows.



3. Seedlings germinating in the hollows.



4. Plants establishing in hollows.

3. EROSION CONTROL FENCES

These are simple low wire netting and jute geotextile fences with a thick mulch layer that can slow and trap runoff water and become a productive vegetated belt across degraded veld or stabilize small dongas and drainages.



Fences can be used on slopes to treat small rills.



Fences with mulch check water flow and stabilize small dongas.

IMPORTANT PRINCIPLES AND GUIDELINES:

- ❖ Fences are suitable for use on flat areas, as well as moderate slopes.
- ❖ It is important to work around existing vegetation.
- ❖ Mulching is important for effective water control and microclimate creation.
- ❖ Fences in series will check even big runoff flows.
- ❖ Livestock and game must be removed or excluded to eliminate grazing.

WHY USE FENCES?

- ❖ They slow down the speed of destructive runoff water flow.
- ❖ Water filters through the fence but silt and plant litter remains behind, helping to build topsoil.
- ❖ The fence also acts as a windbreak, trapping windblown dust and seeds.
- ❖ Old low grade fencing netting can be used together with the jute geotextile.
- ❖ The method is very quick to install.
- ❖ Vegetated strips are created across barren sites, producing seed for dispersal.



1. A sturdy low fence of iron standards and wire netting is made across the site.



2. With the fence complete, a thick layer of mulch is applied over the full length of the fence.



3. Geotextile should always be used together with wire netting.



4. On steeper sites, the fences are installed netting in series down the slope. Note the areas of mulch between the fences.

4. TREATING FOOTPATHS

A simple method for preventing soil erosion and rehabilitating animal footpaths in the veld. The method makes use of mulch which protects the soil, creating favourable conditions for plant establishment.



Before: A typical eroded footpath.

After: Mulch on the path with an establishing plant cover.

IMPORTANT PRINCIPLES AND GUIDELINES:

- ❖ The method is suitable for flat sites and moderate slopes.
- ❖ It is important not to remove any rooted plants in the paths.
- ❖ Water flow along the path must be stopped.
- ❖ Path-forming animals must be removed or excluded.

WHY FIX PATHS?

- ❖ Footpaths channel runoff water and become dongas.
- ❖ Valuable water and topsoil is lost from the veld along eroding footpaths.
- ❖ Numerous path networks contribute to drying out the soil.
- ❖ Exposed path surfaces increase vulnerability to wind erosion.



1. Hard capped soil along the paths can be loosened.



2. Jute geotextile (*Soilsaver*) is cut and laid along the paths.



3. The covered paths are then given a fairly thick layer of mulch.



4. The complete treated network of footpaths.

5. RESHAPING DONGA SYSTEMS

In many cases, it is more practical to completely reshape very severely gully eroded areas which typically have numerous crumbling and dried out vertical walls.



Before: Typical eroded donga system.



After: The shaped and rehabilitated donga system.

IMPORTANT PRINCIPLES AND GUIDELINES:

- ❖ Erosion dongas are the symptoms; to rehabilitate, the cause of the erosion must be removed first.
- ❖ Treat only “young” donga systems that can still become a great deal more eroded.
- ❖ The method is best used in conjunction with other water slowing methods upstream from the treatment site.
- ❖ Larger shrubs and trees should not be removed from the dongas.
- ❖ Mulch is very important for the stabilization of the new soil surfaces.
- ❖ Fences may also be necessary to slow down water flow.

WHY RESHAPE DONGAS?

- ❖ Aridified erosion systems with many dongas never recover, even with gabions in place.
- ❖ “Reshaping” provides a gentler slope on which plants can grow.
- ❖ Many plants removed before “shaping” can later be replanted in the new surface.

- ❖ The soil of the entire treated area can be rehabilitated with a protective mulch layer which will improve rainwater infiltration.



1. A severely eroded site that will not recover without intervention.



2. The gully sides are sloped by hand (or machine).



3. Jute geotextile (*Soilsaver*) is spread over and pinned onto the surface.



4. The entire shaped and stabilized area is then covered with mulch and seeded.

6. COMBINING DIFFERENT REHABILITATION TREATMENTS

Some sites feature a mixture of different erosion types which require a combination of treatments types. Most often it is a combination of bare, capped soil and minor erosion dongas.



Before: A site with sheet erosion and small rill erosion.

After: A combination of treatment types.

IMPORTANT PRINCIPLES AND GUIDELINES:

- ❖ It is important to “read” the natural flow of the runoff water correctly.
- ❖ Existing rooted vegetation should not be disturbed.
- ❖ Each method (hollows, fences, paths and reshaping) should be used where it will be most effective.
- ❖ Experience has shown that the use of mulch is critical for success.
- ❖ Livestock and game must be removed or excluded to eliminate grazing.

WHY COMBINE METHODS?

- ❖ It can be done where bare, capped soil occurs with small rills and dongas and destructive runoff is over a wide area.
- ❖ Sometimes the fences are needed to prevent the hollows from silting up the first time it rains.
- ❖ Using a combination of methods will be more effective for rehabilitation and also more cost-effective.



1. Many sites have sheet, rill and donga erosion in combination.



2. First treat the sheet eroded sites with mulched hollows.



3. Erosion fences are added where the water flow must be checked.



4. Reshaping and mulching of small dongas in between the sheet eroded areas.

7. USING STONE GABIONS

Traditional stone gabions have a place in any rehabilitation plan and are particularly useful for rehabilitating degraded drainage channel and donga systems.



Before: Severe donga erosion.



After: A functional stone gabion.

IMPORTANT PRINCIPLES AND GUIDELINES:

- ❖ Only use stone gabions if an adequate source of stone is available nearby - do not collect stones from the veld.
- ❖ The correct shape, foundation and height of a gabion is critical and must be well planned, the cost of failure is very high.
- ❖ Gabions must be enclosed in wire netting to prevent stones from rolling downstream during flooding.
- ❖ The velocity of water flow must be slowed, but also channelled in a non-erosive way. Silt and organic material should be trapped by geotextile in the gabion.
- ❖ Use gabions only if absolutely necessary and if the problem cannot be solved with a faster, cheaper method.

WHY CONSTRUCT STONE GABIONS?

- ❖ Gabions are used where a more robust “calming” of runoff flow is required.
- ❖ Gabions are used where it is necessary to trap and hold large volumes of silt.
- ❖ Gabions can be used to stabilize roads across drainages.
- ❖ Gabions can be used in series to stabilize degraded drainage banks.



1. First a trench is dug into the donga floor and sides.



2. The trench is lined with wire netting and the gabion constructed with stones.



3. When at the correct height, the wire netting is closed tightly over the gabion.



4. The upstream side of the gabion is then lined with geotextile to trap silt and fine plant material.

8. ESTABLISHING PLANTS IN THE REHABILITATION TREATMENTS

The most important objective for any rehabilitation project is to establish a permanent and dense cover of soil protecting plants as quickly as possible.

It is very important that the locally occurring plants be used as they will have the best chance of surviving conditions in degraded areas.

All sowing or planting must be accompanied by some form of micro-habitat treatment such as moisture-capturing hollows, mulching with local plant material, surface covering geotextile or over-mulching with wood chip mulch. Simply seeding and planting into eroded sites will NOT be successful.

The plants suitable for use in the Little Karoo (Oudtshoorn - Calitzdorp) area are as follows:

SEEDING	PLANTING
<i>Fingerhuthia africana</i> <i>Tetragona fruticosa</i> <i>Tripteris sinuata</i> <i>Salsola aphylla</i> <i>Zygophyllum retrofractum</i> <i>Pteronia glauca</i>	<i>Pentzia incana</i> <i>Malephora lutea</i> <i>Leipoldtia schultzii</i> <i>Ruschia approximata</i>

Other suitable plant species that can be used in rehabilitation projects are the grasses:

Cenchrus ciliaris
Eragrostis curvula
Digitaria eriantha
Cynodon dactylon
Chloris guyana.

Seed and plants are obtainable or can be ordered from:

Renu-Karoo Veld Restoration CC
Sue Milton-Dean and Richard Dean
Tel: 023 - 5411 828 Mobile: 082 7700 206
Email: sukaroo@telkomsa.net
renuaroo@gmail.com.

9. MAINTENANCE IS CRITICAL

Efforts at soil erosion control and veld rehabilitation will certainly fail without regular checking and maintenance. Treatment sites should be inspected after each rainfall to check if any physical repairs are necessary.

Typical maintenance requirements and the actions required after rains are as follows:

HOLLOWS:	
Hollows silted up.	Empty out hollows.
Earth walls break.	Reconstruct walls.
Mulch is washed away.	Remulch hollows.
Seed is washed away.	Reseed.
Still sign of significant water flow.	Dig more hollows.
FENCES:	
Fence undermined by water.	Fix and apply wider and thicker mulch layer.
Mulch washed/blown away .	Remulch with heavier material or thicker layer.
Water flows around edge.	Extend fence.
Sign of water flow between fences.	Construct additional fences in between.
Fences flattened by water flow.	Construct more robust fences with heavier materials.
FOOTPATHS:	
Mulch washed away.	Remulch and add fences.
Paths still channel water.	Add mulch and short fences across the paths.
No plant growth in mulch.	Seed with grasses.

<p>RESHAPED DONGAS:</p> <p>Water flow recreates the donga under the <i>Soilsaver</i> and mulch.</p> <p>Water flow washes mulch layer away.</p> <p>Newly established plant growth is inadequate to check the flow.</p> <p>Destructive flow continues to damage treatment despite treatment.</p>	<p>Effective fences or gabions needed in upstream drainage.</p> <p>Add fences on sloped areas and remulch.</p> <p>Remulch and reseed.</p> <p>Check the cause of the accelerated runoff and take action (eg: Construct contour drain).</p>
<p>STONE GABIONS:</p> <p>Water undermines or eats around gabion.</p> <p>Water going over the gabion erodes the streambed.</p> <p>Flooding drainage knocks away the gabion.</p>	<p>Overflow provision inadequate; fix holes and line with geotextile and a thick layer of mulch.</p> <p>Line streambed at wall with stones, double layer enclosed with wire netting.</p> <p>Insufficient number of gabions in the drainage and gabions probably too high and not correctly installed.</p>

10. MANPOWER:

All of the rehabilitation treatments described can be installed using unskilled workers with the necessary on-the-job training and very careful supervision. The installation of the described treatments is not at all technically demanding, but they must nevertheless be properly installed to be effective.

With the exception of the donga reshaping and gabion construction methods, most of the treatments need minimal worker numbers for installation (2 or 3). The loading and carting of mulch material may require additional workers for time-efficiency and a tractor/truck driver may be necessary to transport the mulch from where it is offloaded as close to the rehabilitation sites as possible.

11. MATERIALS

The rehabilitation treatments described were designed with cost-effectivity in mind. The hollows require only mulch and seed. The fences can be made using scrap wire and wire netting and old rusty and bent iron fencing standards cut up into short sections. It would not be cost-effective to purchase new standards, wire and wire netting material. The reshaping treatments require jute geotextile (*Soilsaver*) and mulch. The *Soilsaver* is pinned to the ground, by hammering sharpened sections of old wooden fencing droppers into the material.

The construction of stone gabions requires either fabricated wire gabion baskets or wire netting to enclose the stone-packed structure.

Any wire netting that is used for fencing is suitable, but if netting is specially purchased for rehabilitation work, it is best to purchase fully galvanised material.

The *Soilsaver* is available from Kaytech Engineered Fabrics, tel: 043 - 727 1055 and website: <http://www.kaytech.co.za>. *Soilsaver* is sold in bales of 350 kg each and a bale consists of 1 004m³ of jute netting.

The best mulch to use is a rough wood-chip mulch which is obtainable from sawmills. Do not use sawdust, or other fine material like hay, because it is too fine and blows away in the wind. In the little Karoo, obtain wood chip mulch from PSP Timbers in Oudtshoorn, tel: 044 - 272 6236. The mulch is very cheap, but PSP Timbers charge to transport it in 30m³ loads to the rehabilitation site.

12. SUGGESTED READING

The following books contain useful information about rehabilitation and veld management:

Caring for Natural Rangelands.

Author: Ken Coetzee.

Published: 2005.

Published by: Kwazulu Natal University Press.

Game Ranch Management - 5th Edition.

Editors: J du P Bothma & J G du Toit.

Published 2010.

Published by: Van Schaik Publishers, Pretoria.

Karoo Veld - Ecology and Management.

Editors: K J Esler, S J Milton and W R Dean.

Published: 2006.

Published by: Briza Publications, Pretoria.

13. CONTACT THE FOLLOWING PEOPLE FOR ADVICE:

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14. SPONSORS