

Evaluation of different treatments to restore disturbed quartz fields in the Knersvlakte (Lowland Succulent Karoo)



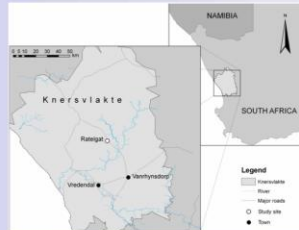
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Knersvlakte

Located in southern Namaqualand the Knersvlakte is the core area of the unique quartz fields. These patches of white gravel house a unique, species rich flora with many endemic species (Schmiedel & Jürgens 1999) and make the region a priority area for conservation (Lombard et al. 1999). Identified threats to the biodiversity of the Knersvlakte are unsustainable grazing management, mining activities, illegal, commercial collection of minute succulents and construction work (Desmet et al. 1999).



Location of the Knersvlakte on the west coast of South-Africa and the farm Ratelgat situated on the N7 around 20km northwest of Vanrhynsdorp (shape files kindly provided by CapeNature).

Objective

This study aims to identify suitable restoration methods to reverse the negative effects (erosion and loss of vegetation cover) created through the construction of an underground water-pipeline. The pipeline was installed in 2000 and runs through quartz fields and zonal vegetation of the Ratelgat farm which belongs to the Griqua Development Trust. The treatments were developed together with the Griqua community and aim to assist the farmers with the restoration of their land.



The treatments "levelling + stones" and "levelling + planting" of *C. spissum* individuals (Photos: Sophia Etzold)

Ruschia burtoniae



Which treatment is most successful in restoring the vegetation of the quartz fields ?

Applied treatments:

The experiments were installed in October 2004 on the pipeline sections crossing the widespread plant communities on quartz fields (*Ruschia burtoniae*- and *Cephalophyllum spissum* community) and include levelling of the soil surface which was partly combined with scattering of quartz stones and (on *C. spissum* community sites only) planting of *C. spissum* individuals and compared with controls (all plots were 1m x 3m). Each treatment was replicated 10 times. The plots were revisited in 2005 and 2008.

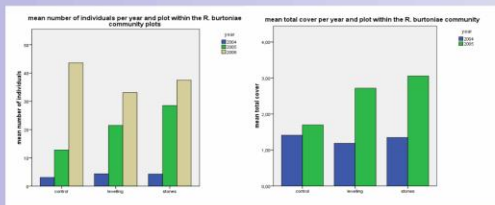


The pipeline at Ratelgat: soil erosion and loss of vegetation cover are visible (Photos: Sophia Etzold)

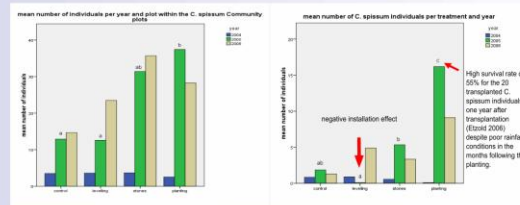
Cephalophyllum spissum



Results



No significant treatment effect for mean number of individuals of all species was found for 2005 or 2008 for the *R. burtoniae* community, but an insignificant increase in mean total cover under the "levelling" and "levelling + stones" treatments is visible.



A treatment effect was stated for mean number of individuals in 2005 with $H = 12.67$, $p = .005$ and $H = 9.019$, $p = .029$ in 2008 for the *C. spissum* community and for *C. spissum* individuals alone in 2005 with $H = 27.353$, $p = .000$. Different letters above bars indicate significant differences between treatments according to LSH with Bonferroni-Holm correction.

Discussion

Although levelling seems to have destroyed some *C. spissum* individuals the development of these dwarf shrubs until 2008 is very positive. The combination of levelling with planting or scattering of stones seems to be even more beneficial for the whole community. It is assumed that quartz stones provide the necessary microhabitat and facilitate the accumulation of water, nutrients and seeds. They are a cheap restoration method if available in the surrounding area. In contrast, the *R. burtoniae* community showed no significant response to the treatments. It can be argued that its fruticose life form makes it less vulnerable to unstable soil surfaces and thus less dependent on its performance in the restoration treatments.

Conclusion

The significant improvement of the Knersvlakte and quartz-field endemic *C. spissum* in contrast to the relatively widespread occurring *R. burtoniae* community gives hope for the restorability of quartz fields in the Succulent Karoo, which are typically dominated by compact dwarf shrubs similar to *C. spissum* (Schmiedel & Jürgens 1999). All three treatments can be recommended for future quartz field restoration but in terms of cost-effectiveness the "levelling" and "levelling+stones" treatments are advised.

References

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Acknowledgements

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