Factsheet # 06

Using perennial grasses to assess rangeland degradation

A three-phase model of grass population decline to indicate an impending tipping point

Challenge

- The ongoing increases in drought frequency, overgrazing and lack of adaptive management threaten rangelands in dry regions, risking desertification that may require intensive, costly and time-consuming restoration efforts.
- In Namibia, a healthy rangeland is typically dominated by palatable perennial grasses, which are often good for the soil, prevent erosion, and can also withstand periods of drought.
- However, the process of desertification is marked by a rapid shift to a degraded state where less desirable species for grazing take over, eventually leading to bare soil and/or dense thickets of bush.
- Early management intervention **BEFORE** the onset of heavy degradation has a good chance of restoring the rangeland.
- Therefore, identifying key indicators for the three degradation phases from a healthy (Phase 1), partially degraded transition phase (Phase 2), to a heavily near-permanent state of degradation (Phase 3) is crucial for timely management action.

Assessing perennial grasses

Different species of perennial grasses can decrease or increase in number depending on their particular adapted response to grazing intensity/pressure.

Therefore, on the two main tenure systems within the Greater Waterberg Landscape - “freehold” and “communal” areas - we identified three key perennial grass species as indicators of rangeland degradation levels: “Curly-leaved love-grass”; “Silky bushman-grass”; and “Lehmann’s love-grass”.

Identifying thresholds

The grasses were counted in heavily grazed areas (likely degraded) and then at different distances up to 3 km away, where grazing intensity was assumed lower (likely healthy).

Along the grazing gradients, where sharp changes in the densities of each species were observed, indicator values were derived from the data to provide suggested thresholds between and within the proposed phases of degradation.

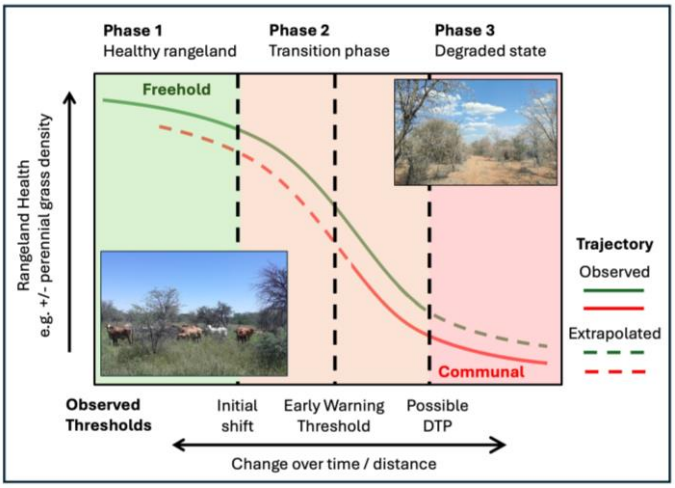

Figure 1: The three phases of rangeland health identified in our study. The collected data revealed that communal areas were often more degraded than freehold farms – both with the potential for change in either direction (extrapolated). Our data also revealed three points of transition (critical thresholds), potentially useful as management tools: an “initial shift” between Phase 1 & Phase 2; an “early warning threshold” during Phase 2; a “possible DTP” (Desertification Tipping Point) between Phase 2 & 3 beyond which degradation may be near-permanent. *Credit: Faith Chambara; Mark Bilton.*

Credit cover photo: Faith Chambara

Highlights

- The three perennial grasses displayed distinct patterns in response to grazing that together could classify rangeland health or degradation: two species densities increasing with lower grazing towards healthy state ("Curly-leaved love-grass"; "Silky bushman-grass"); and one species density increasing under higher grazing towards a degraded state ("Lehmann's love-grass", Figure 2).
- Large proportions of communal lands in our study area were already highly degraded, and in potential need of active management (Figure 1).
- Distinct density values (number of individuals per 100 m^2) for the two sensitive "healthy state" species could be used as "suggested values" to further classify "healthy" or "degraded" rangelands, and importantly to know the "time to take action" before degradation becomes near-permanent (Figure 2).

Practical and Policy Implications

- In the Greater Waterberg Landscape, simple assessment of approx. 5 plots (measuring 100 m^2) per 0.25 ha could be used to detect if preventative (Phase 2) or intensive restoration management (Phase 3) is needed.
- Increasing knowledge regarding thresholds and sustainable rangeland management should be emphasized in communal areas. Such knowledge is also important on freehold land as droughts become more frequent, and if bush encroachment takes hold.
- Change in policy (e.g. tenure rights for groups) is required to enable communal areas to access and implement changes in management more easily, to benefit the people most reliant on these rangelands for food and income.
- Studies should further refine the thresholds for these three species to act as genuine indicators of rangeland degradation in the Greater Waterberg Landscape.
- We recommend the conceptual transfer to other regions.

Key Findings

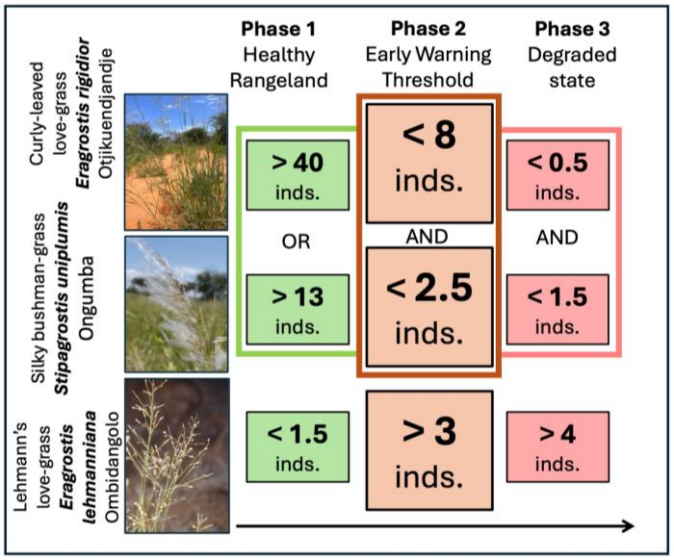

Figure 2: Thresholds of potential species-specific density values (individuals per 100 m^2) suggested from the data collected, which could be used to classify rangeland health in GWL. Suggestion of assessment rules:

- Healthy if either *E. rig.* OR *S. uni.* exceed Phase 1 values;
- If between Phase1 & 2 values, continue to monitor for any deterioration.
- Take preventative action if *E. rig.* AND *S. uni.* fall below Phase 2 values;
- If Phase 3 values for *E. rig.* AND *S. uni.* are achieved, intensive restoration management likely needed.

Photo credit: Lisa Schwarz (NamTip); David Hoare (iNaturalist.org).

Authors

Munyebvu-Chambara, F. & Nesongano, W.C., Department of Environmental Science, University of Namibia, Namibia. Contact: fchambara@unam.edu.na
Bilton, M.C., Bilton Environmental Resources / NUST, Namibia.
Contact: mcbilton.ecology@hotmail.com
Orbán, I. & Linstädter, A., Biodiversity Research & Systematic Botany, University of Potsdam, Germany.

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The NamTip Project

The collaborative German-Namibian research project "NamTip – A Namibian Perspective on Desertification Tipping Points in the Face of Climate Change" aims to better understand the development of ecological tipping points in dryland rangelands by assessing desertification and woody plant encroachment processes. It also explores management options for preventing such tipping points and restoring degraded rangeland ecosystems.

www.uni-potsdam.de/en/namtip

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Project Lead

Prof. Dr. Anja Linstädter
E-Mail: anja.linstaedter@uni-potsdam.de

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