Factsheet #15

# Science-led perspectives to guide wildlife-based strategies of land use

## Insights from a German-Namibian research cooperation

## Introduction

In Namibia, wildlife-based land use options have been on the rise since the 1970s. The starting point was the Nature Conservation Ordinance in 1975 which enabled wildlife use on freehold land. There are several reasons for this shift ranging from policy incentives, to economic benefits, and to challenges posed to rangeland businesses by ecosystem degradation and prolonged droughts. However, scientifically speaking it is still not fully understood whether and how wildlife-based rangeland management strategies are superior to traditional livestock production. The project ORYCS explored a scientific basis for future decision-making on this topic and here we are providing key insights from this project in the following.

In doing so, this factsheet summarises a series of factsheets developed to communicate key scientific findings in a condensed manner to the stakeholders in the field. In addition, it draws on the findings presented in the project's scientific publications. With this factsheet, the strategic implications of the results are elaborated in the form of strategic statements, which are explained in a supporting way. This integrated overview of perspectives for wildlife-based strategies of land use in Namibia concludes with upcoming challenges and open questions for the future.

## Why consider wildlife-based options?

ORYCS research found benefits of wildlife-based management strategies for various reasons:

- **Increase in ecosystem health and biodiversity:**
  In two independent model-based assessments, we found that including wildlife, and more specifically, including browsers into rangeland management will stabilize the productivity of the system, increase biodiversity and ecosystem health and prevent woody plant encroachment (Factsheet #6, Szangolies et al. 2023, Irob et al. 2022, 2023).
- **Improvement of soil-water-vegetation interaction and prevention of bush encroachment:**
  In an eco-physiological study on savanna tree species, we could show that browsing at different intensities will significantly alter water uptake by shrubs and trees both in terms of the amount of water used and the sources of water (deep or upper soil layers). The study further indicates that browsing weakens woody plants, by making them more dependent on top-soil moisture, which can help prevent encroachment (Factsheets #4, #9).
- **Balancing grass-shrub-tree competition**
  By tracking the movement and behavior of wildlife, we could show that they have clear impacts on the spatial distribution of different nutrients in the soil, potentially balancing competitive stress for grasses and herbs with woody plant species (Factsheet #9).
- **Improved adaptation for climate change:**
  Analyzing behavioral patterns of Springbok, Kudu and Eland, we could reveal how those species adapt to various climatic conditions, especially heat stress. This has implications for their suitability for wildlife-based management under climate change (Factsheet #3, Berry et al. 2023).

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## Perspectives for wildlife-based management strategies

**Strategic statement #1: Consider a broad mixture of species, in particular grazers and browsers**

- Including a variety of large herbivore species, specifically a mix of grazing and browsing species can prevent woody plant encroachment, increase plant and animal diversity and stabilize rangeland ecosystem productivity (Factsheet #6, Irob et al. 2022, 2023, Szangolies et al. 2023).
- Different wildlife species respond differently to landscape configuration in terms of vegetation and water availability but also in terms of their behavioral adaptation to heat stress (Factsheet #3, Berry et al. 2023). A diverse mix of species will hence likely buffer against catastrophic declines in animal numbers due to e.g. drought events or land degradation (Factsheets #5, #8).

**Strategic statement #2: Include wildlife in long-term regeneration efforts**

- Wildlife species specific behavior and preferences in terms of diet (e.g. grazing vs browsing as in Factsheet #6, Irob et al. 2022, 2023, Szangolies et al. 2023), water dependence, territoriality (Factsheet #7, Hering et al. 2022a, b) and landscape structures (e.g. open vs covered by trees, Factsheet #5) can exert feedbacks on dynamics and distribution of soil nutrients, organic matter and soil water. This will alter spatio-temporal conditions for tree-grass competition and establishment and growth of different types of plants (Factsheets #4, #9) and could be used for targeted ecosystem regeneration.

**Strategic statement #3: Livestock and wildlife together can be good for the ecosystem**

- Wildlife-based solutions that replace livestock or include livestock in mixed systems can be very useful as our studies have shown. Wildlife and livestock stocking rates should be carefully determined with species specific formulas. Overstocking under wildlife-based management will as well have detrimental effects on the ecosystem and should be avoided by all means (Factsheets #6, #9, Szangolies et al. 2023, Irob et al. 2022, 2023).

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**Table 1:** Overview list of factsheets produced in the ORYCS project that summarize the results for stakeholders and present them in an understandable way.

| # | Titel of factsheet | Authors |
|---|---|---|
| 1 | The ORYCS project – a German-Namibian research cooperation | Blaum, Hauptfleisch, Geißler |
| 2 | Spatio-temporal dynamics of groundwater quality in the Etosha region | Hipondoka, Wanke, Hamunyela, Uugulu |
| 3 | How antelope respond to heat in an arid savanna | Berry, Dammhahn, Blaum |
| 4 | Drivers of water cycles | Herkenrath, Mpala, Hamunyela, Hipondoka, Geißler |
| 5 | How woody plants impact the selection of sites used by Springbok | Morkel, Mapaure |
| 6 | Savanna response to management strategies | Irob, Tietjen, Smith, Lüdtke, Rauchecker, Hauptfleisch |
| 7 | Ungulate movements across the red-line: A case study (two/four-page version) | Hering, Jago, Smith, Hauptfleisch, Blaum |
| 8 | Animal movement behavior | Stiegler, Hering |
| 9 | Effects of wildlife on soil and vegetation | Geißler, Shikangalah, Herkenrath, Enkono, Mapani, Uugulu |
| 10 | Mapping vegetation with remote sensing | Smith, Bookhagen, Hering, Herkenrath |
| 11 | Mapping water with remote sensing data | Smith, Hipondoka, Bookhagen |
| 12 | Cumulative impact of fences and land use on elephant movement | Kraus, Liehr, Lüdtkemeier, Hauptfleisch, Makando, Knox |
| 13 | Farmers‘ perception of wildlife | Lüdtke, Tausendfreund, Liehr |
| 14 | How to bring knowledge and policies to farmers | Rauchecker, Cimenti, Liehr |
| 15 | Science-led perspectives for wildlife-based strategies of land use in Namibia | Blaum, Lohmann, Liehr, Lüdtke, Rauchecker, Mapani, Hauptfleisch, Hipondoka, Mapaure, Uiseb |

**Strategic statement #4: Use the outstanding capabilities of remote sensing products for higher-level monitoring**

- We found that browsing significantly impacts water use by woody plant species (Factsheet #4) and land use type affects water quality (Factsheet #2). Within ORYCS cutting edge remote sensing products have been developed to estimate and map surface and sub-surface water availability. The knowledge and tools provided could help land and water management on a regional or landscape scale (Factsheets #4, #11)
- For management at the landscape scale remote-sensing based maps of vegetation (Factsheet #10) and water availability (Factsheet #11), as well as knowledge on animal preferences and behavior (see above) can help making knowledge based and sustainable decisions.

**Strategic statement #5: Escape isolated solutions and move to a landscape approach**

- We have collared and tracked the movement and behavior of over 30 antelopes in the Etosha area. The findings show that those animals track green biomass occurrence over large distances, seemingly even anticipating upcoming rainfall and greening. Fences, hindering respective movements caused enormous disruptions in animal behaviour (Factsheets #7, Hering et al. 2022a, b) and can lead to major human-wildlife-conflicts (Factsheet #12, Lütkemeyer et al. 2023).
- Consequently, a landscape scale perspective for management beyond the individual farm might be useful to facilitate wildlife and ecosystem health and resilience to seasonal variations and climatic extremes. Despite promising ecological and socio-economic benefits, there are challenges in terms of property rights and wildlife use.
- Fencing strategies should consider the motivation for different types of species desire to cross. Fence effectiveness and corresponding maintenance costs can be high and an ecology based fencing strategy might be economically and ecologically beneficial (Factsheets #7, #11). Clearly the current fencing strategies and practices regarding wildlife need to be re-evaluated.

Photo: Dirk Lohmann

Photo: Stefan Liehr

## Challenges

For the implementation of wildlife management, especially in dry landscapes, the issues of longer distance wildlife migration and the removal of fences pose major challenges. This leads to far-reaching societal questions that need to be addressed:

- To avoid conflicts and mere problem shifting instead of problem solving, an effective process of cooperation between different actors is needed, including consideration of their different interests.
- This also implies the need to strive for a culture of cooperation, e.g. in the form of protected areas (conservancies / private reserves) and to address issues of shared resources and the tragedy of the commons.
- The importance of communication and mutual exchange in more cooperative landscape-based approaches (Factsheet #14) may require a concerted effort to change management cultures.
- Research shows that society's appreciation of wildlife is closely related to opportunities for management strategies. Shaping public opinion and educating people about the value of wildlife is therefore a long-term issue (Factsheet #13).
- The legal framework regarding the ownership model for huntable game should be examined. The question should be critically examined whether a change from individual to collective property rights also makes sense for landowners in a given area, similar to the communal conservancy model. Also to be examined would be whether the fence requirement for landowners to own huntable game should persist.
- The landscape approach requires appropriate planning tools based on monitoring (Factsheets #10, #11) to avoid overstocking and subsequent degradation as well as human-wildlife conflicts and conflicts between landowners.
- Integrated rangeland management should take into account not only wildlife but also livestock. Especially the need of fences for livestock management such as rotational grazing should be discussed. The shift to a landscape approach could enable pastoral practices with active herding.
- In summary, promoting wildlife conservation through wildlife-related land use seems to require a combination of short- and long-term effective measures, involving stronger cooperation, economic market mechanisms, political regulations, planning tools and awareness raising to change wildlife valuation.

## Open Questions

Despite extensive new knowledge, there are still unanswered questions on the ecological and societal side:

- Many details of wildlife ecology are still unknown: Specific fodder needs, flexibility in fodder needs, relation of resource availability, survival and reproduction…
- What are the specific requirements of wildlife species in terms of migration (hard to tell due to current “all-fences” scenario).
- What are land tenure solutions for a landscape approach? Can a landscape approach including communal conservancies and also private reserves work?
- How can integrated rangeland management work on a landscape level? Can grazing rights and management be incorporated into the conservancies’ tasks?
- What management systems are feasible in the future under climate change conditions?

Photo: Stefan Liehr

## The ORYCS Project

The German-Namibian research project “ORYCS – Options for sustainable land use adaptations in savanna systems” aims to assess the suitability of wildlife management strategies in Namibia as options for adapting land use to climate change in savanna ecosystems.

The ORYCS inter- and transdisciplinary research approach integrates scientists from Germany and Namibia in the fields of wildlife ecology, vegetation dynamics, hydrogeology and social-ecological research and simulation modelling cooperating with actors at local, regional and national levels, in particular private farmers, communities, NGOs, and public authorities.

In the light of local knowledge, ORYCS uses a broad set of research techniques including field observations and interviews, experimental manipulations, GPS-telemetry, remote sensing, modelling and simulation, and social-ecological assessments to analyse interactions and feedbacks between climate, water, vegetation and wildlife for different types of wildlife-based land-use options.

Knowledge transfer plays a crucial role in the ORYCS agenda to connect researchers with practitioners and to bridge the gap between research findings and application in practice.

**www.orycs.org**

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Factsheets of the ORYCS project, see Table 1

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