

Title

Uncovering the Origins of Phantas: Guiding Conservation in Nepal's prime Tiger Habitat

Focus and aim of the project (250 words)

In the Terai of South Nepal, conservation efforts have increased the populations of keystone species like the Continental tiger¹. This shift in ecosystem functioning necessitates review of landscape management, to ensure that the ecosystem can support increased wildlife while minimizing human-wildlife conflict. Bardia National Park features savannah-like grasslands known as Phantas, within otherwise forested areas. Park-management actively maintains these by burning and mowing², as they are considered vital feeding grounds for the tiger and its prey, primarily deer³. However, their origin is unclear and may have resulted from past human activities rather than natural processes, raising questions on their ecological value. Current research suggests that, for deer, forest browsing might be more important than these grasslands⁴. This study aims to determine the origins of Phantas. If Phantas are human-made, their maintenance may offer limited ecosystem benefits, which would justify changing the management strategy of Bardia and reallocating resources.

Phantas may have developed from riverine grasslands, human land-use, past landscape management, or natural grazing (Figure 1a). With phytoliths, silica microfossils with different morphologies for different plant species, we can infer past plant communities corresponding to these scenarios, through their assemblages in the soil⁵.

We will collect surface samples to establish reference assemblages for each scenario (Figure 1b). We will then auger five soil cores of 80 centimeters along a transect crossing the Phanta. Each core is analyzed for phytolith-assemblage at 10 centimeter intervals. By comparing these assemblages with the modern references, we can infer the Phantas' development⁶, informing future conservation policy.

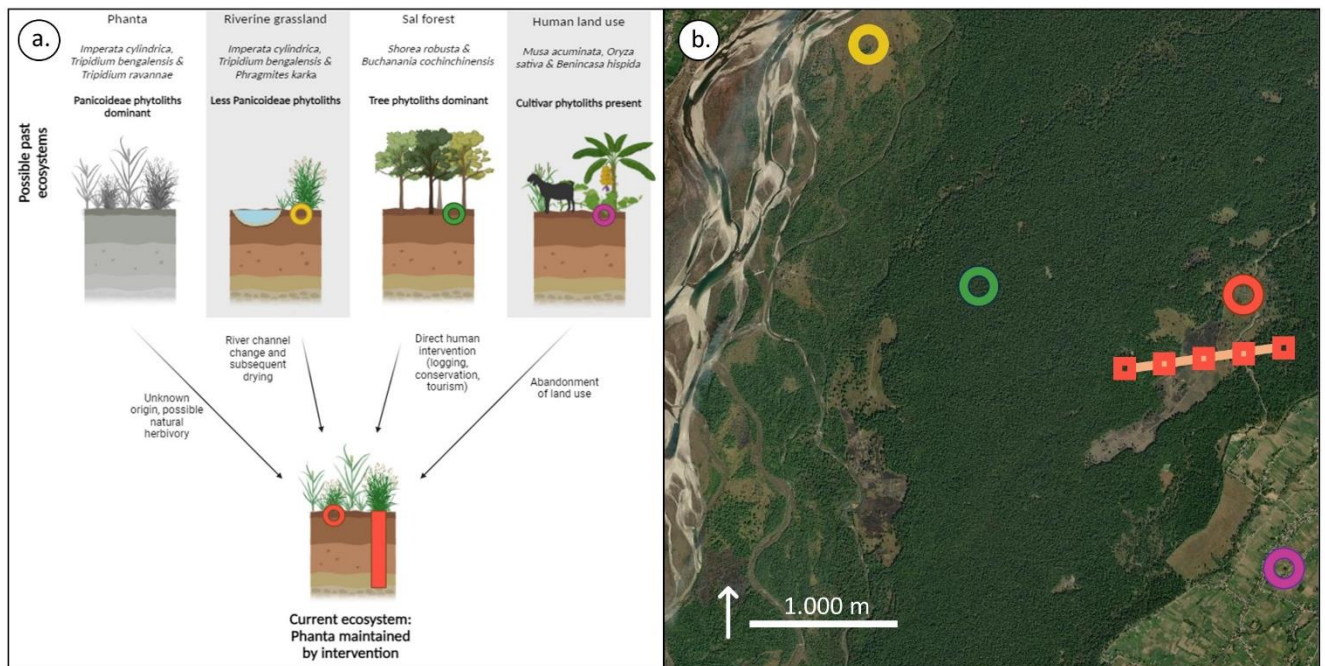


Figure 1 Schematized research description with a) different scenarios leading to Phanta development and the expected plant & phytoliths assemblages, and b) modern reference sampling sites, colored corresponding to scenarios, and the transect (1.000 m) for coring.

Relevance given the PE&RC mission (Understanding the functioning of natural and managed ecosystems to improve the quality of life) (max. 150 words)

This research project finely walks the line of understanding both natural and managed ecosystems, as the natural state of the ecosystem has the potential to shape the management of the national park. On a fundamental level, this study can also shed light on past human activity in the Terai in general, which has been understudied thus far.

Of additional importance, is that proper landscape management in the Terai is crucial for reducing human-wildlife conflict, which has escalated with the growing tiger population. Although the tiger is generally appreciated as a source of ecotourism for the Bardia region, increased attacks have fostered negative attitudes towards this species, potentially hindering their recovery. By providing additional data for comprehensive conservation policies, habitat can be optimized to keep the tiger within the park as much as possible. This in turn improves the quality of life of the local community by increased sense of safety.

The manner in which the proposed project will strengthen the institutional collaboration, identifying the specific role of the proposed candidate, including the expected output of the project (150 words)

This project will establish a formal collaboration between the Ecosystem and Landscape Dynamics group (UvA) and the Soil Geography and Landscape group (WUR). Both groups focus on landscapes from complementary perspectives—soils and biodiversity- offering a chance to integrate these aspects for a deeper understanding of landscape dynamics.

The candidate, with fieldwork experience in the area, will obtain permits, and collect, extract & quantify phytoliths from samples. The data will be analyzed to determine the historical ecosystem of the Phanta. The outcomes of this study complements other landscape reconstruction methods used in her PhD. Results will be published in a peer-reviewed journal, but also reported to the National Trust for Nature Conservation (NTNC) in Nepal, which manages Bardia National Park. The WUR has several contacts with NTNC, working on the Terai through WEC, and the insights that could be gained by involvement of ELD are therefore valuable beyond SGL.

Groups involved

- Soil Geography & Landscape group (SGL), Wageningen University & Research
- Ecosystem and Landscape Dynamics (ELD), Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam

Scientists involved

Prof. Dr. William D. Gosling (ELD)

Dr. Crystal N. H. McMichael (ELD)

Dr. Annegret Larsen (SGL)

PhD candidate involved

Zoë Kleijwegt (SGL), Employment period Sept. 1st 2022 – Sept. 1st 2026

Time to be spent on the project by the PhD candidate

The request is to fund four months of additional work for the PhD candidate. This would consist of one month of field work and accompanying preparation (permit arrangements etc.), two months of sample preparation and processing and one month to write up the results. Costs for the fieldwork can largely be funded through the existing project of the PhD candidate (*Save the Tiger! Save the Water! Save the Grasslands!*), for which fieldwork will already be conducted in the area in February 2025. The following work will occur from May to July 2025. Additional costs funded through the 35% overhead of the interinstitutional collaboration grant involve hiring staff for extra days in the field, chemicals for sample preparation and laboratory fees to date samples.

References

- ¹ DNPWC, (2022). Status of Tigers and Prey in Nepal. *Department of National Parks and Wildlife Conservation & Department of Forests and Soil Conservation*. Ministry of Forests and Environment, Kathmandu, Nepal.
- ² Thapa, S.K., de Jong, J.F., Hof, A.R., Subedi, N., Joshi, L.R., Prins, H.H.T., (2022). Fire and forage quality: Postfire regrowth quality and pyric herbivory in subtropical grasslands of Nepal. *Ecol Evol* 12, e8794–e8794.
- ³ Thapa, S. K., de Jong, J. F., Subedi, N., Hof, A. R., Corradini, G., Basnet, S., & Prins, H. H. T. (2021). Forage quality in grazing lawns and tall grasslands in the subtropical region of Nepal and implications for wild herbivores. *Global Ecology and Conservation*, 30, e01747. <https://doi.org/10.1016/j.gecco.2021.e01747>
- ⁴ Sciumbata, M. (2024), *personal communication*.
- ⁵ Piperno, D.R. (1988) Phytolith analysis: an archaeological and geological perspective. *Academic Press*, San Diego
- ⁶ Witteveen, N.H., White, C., Sanchez Martinez, B.A. et al. Phytolith assemblages reflect variability in human land use and the modern environment (2024). *Veget Hist Archaeobot* 33, 221–236.<https://doi.org/10.1007/s00334-023-00932-2>