Preliminary report on the apex predators of Banhine National Park and the potential Limpopo-Banhine corridor

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Executive summary

- Extensive surveys revealed small but critical populations of large predators including cheetah, lion and endangered African wild dog in Banhine National Park.
- Importantly, there are large tracts of habitat with little human impact and no livestock that are currently supporting these predators and other wildlife.
- Based on these preliminary results, we strongly believe that Banhine could be restored, given the correct conservation investment and action. This should be given immediate conservation priority. Such a development would provide for considerable economic development in this otherwise economically depressed region.
- We recommend the formulation of a Park Development Plan, focussing on the opportunities to link biodiversity conservation to economic development. This plan should then be used to attract donor funding.
- It is crucial that conservation corridors that permit dispersal for threatened predators are secured if Limpopo and Banhine Parks are to properly function together, and thereby contribute to the conservation of biodiversity and local economic development.
- To assist with the park development and corridor planning process, we are providing preliminary information on critical predator areas and wild ungulate occurrence.

Introduction

The Greater Limpopo Transfrontier Conservation Area (GLTFCA) is important for the regional and global viability of cheetah, lion and African wild dog because it includes population strongholds in South Africa and Zimbabwe, which are contiguous to large tracts of potential habitat in Mozambique (IUCN, 2006; 2007). South-western Mozambique could provide additional key habitat, which would increase the regional viability of these species by increasing connectivity and providing space for range and population expansion. Presently, however, there is very little known about predator occurrence, prey base or threats (conservation biology) in the Mozambican components of the GLTFCA. Addressing

this need for reliable information is the focus of our project. Here we provide some background to the project, initial findings and the implications for effective conservation of the apex predators, and we highlight the opportunities for linking this to local economic development. Included also are records of elephant recorded during these surveys.

Our initial investigations revealed small but critical populations of cheetah, lion and African wild dog in the Limpopo National Park, which casts a very positive light on the opportunities for these species' conservation across the broader area (Andresen *et al*., 2014; Everatt *et al*., 2014). However, despite the region's vastness, human densities and human impacts are increasing, with consequent declining opportunities for conservation (Newmark, 2008). There is therefore a pressing need to identify and secure cheetah, lion and African wild dog populations in this region before their habitat is further fragmented or irretrievably lost. The current situation therefore represents a window of opportunity but the timing is critical: if potential range areas in south-western Mozambique support resident sub-populations that could contribute to the viability of a regional meta-population, then the conservation interventions required for their persistence must be determined and implemented. This project is taking a landscape-scale approach to provide the necessary information to improve conservation prospects for cheetahs, lions and African wild dogs in the GLTFCA. Our project will be collecting data on an ongoing basis, and mechanisms should be developed to feed these additional findings and insights into proposals for the development of the parks and corridors.

Objectives

Our project is a research project, with the following broad objectives:

1) Quantify cheetah, lion and African wild dog distribution, prey and habitat availability and threats in the Mozambican GLTFCA.
2) Quantify source-sink dynamics between established protected areas in South Africa and Zimbabwe (Kruger National Park and Gonarezhou National Park) and adjacent areas in Mozambique.

3) Evaluate dispersal barriers and potential corridors between all National Parks in the GLTFCA and evaluate and identify areas (i.e., Banhine National Park and Zinave National Park) that may be naturally recoverable and/or suitable for re-introductions.
4) Evaluate the specific management actions and land use planning required to ensure cheetah, lion and African wild dog (meta-) population viability in the GLTFCA.

Activities to date (July 2014-February 2015)

1) Spoor surveys were conducted to quantify predator occurrence distribution, habitat availability and threats (Appendix 1).
    - 2 052 km of transects walked.
    - 50 x 200 km^2 grid cells surveyed (22 in Limpopo, 15 in Banhine and 13 in Limpopo-Banhine corridor).
2) Detection dog surveys were conducted to collect genetic material (scats), this will be used to estimate predator population density; quantify connectivity and source-sink dynamics.
    - 639 km of surveys walked with detection dog.
    - 47 x 50 km^2 grid cells surveyed (25 in Limpopo and 22 in Banhine).
3) Distance sampling of ungulates was conducted to quantify prey availability for predators and estimate predator carrying capacity (Figure 1).
    - 1 174 km of prey density transects conducted (1 164 km in Limpopo and 610 km in Banhine).

Preliminary findings: Banhine National Park

Our efforts revealed that Banhine hosts populations of cheetah, lion and endangered African wild dog, which were documented in 27 %, 33 % and 7 %, of the surveyed cells, respectively. Our results show there are two important wildlife areas in Banhine; 1) a proportion of the grasslands and wetlands in the north-east and, 2) the southern sandveld (Figure 1). At present, cheetah, lion and wild dog appear to be most abundant in the southern sandveld regions of the park. However, cheetahs also occur in the north-eastern grasslands and cheetah and lion are also present in the north-western sandveld (Figure 1). Human impact, including livestock grazing and illegal hunting, is greatest in the grasslands and

wetlands surrounding the northern core wildlife area and lowest in the southern sandveld (Figure 1). Wildlife densities across Banhine are generally low (e.g., compared to Limpopo National Park), and many species historically occurring (1970's) are now absent (i.e., plains zebra, eland, blue wildebeest, giraffe, Lichtenstein's hartebeest) (Stalmans & Peel, 2009). The prospect of reintroducing these species needs to be explored. Impala (434 recorded) and ostrich (428) were the most numerous herbivores counted in the grasslands, followed by cattle (409) and goats/ sheep (282) (Figure 1). Other grassland species include reedbuck and oribi. Kudu occur widely in the southern sandveld (Figure 1), as do nyala, duiker and steenbok. Elephant also occur widely at low density (Appendix 2). Our preliminary results indicate that there is currently sufficient prey (impala, kudu, ostrich and buffalo) to support populations of large predators in the northern core wildlife area; however, it appears that predators are experiencing difficulty recolonizing naturally and/or populations are supressed due to human-impact in the surrounding grasslands and wetlands. The effective conservation management of this area, together with the reintroduction of extirpated species will contribute to the growth and persistence of apex predator populations. Genetic analysis will determine whether the Banhine cheetah, lion and African wild dog populations are (pre-war) relict, or a result of recent recolonization from Limpopo and/or Gonarezhou National Parks. Depending on these results, augmentation programs may be required to ensure population recovery and long-term viability.

The grasslands of Banhine National Park

Based on our preliminary findings, we strongly believe that Banhine National Park can greatly contribute to cheetah, lion and African wild dog conservation and that it is not too late for the park to be restored. That the revised park boundaries (Figure 1) excludes villages make the restoration of Banhine feasible without resettlement. The grasslands and wetlands and associated xeric baobab 'islands' have natural tourism potential (i.e., stunning vistas, potential to support concentrations of large mammals and birds, permanent water). We strongly believe that Banhine could be restored given the correct conservation investment and action and should be given immediate conservation priority. This would provide for considerable economic development in this otherwise economically depressed region. The role of such conservation areas in driving rural economic activity is widely recognised across Africa, and this approach can, with proper planning and implementation, be replicated in Mozambique. We recommend the development of a Banhine National Park Development Plan focussing on the opportunities to link biodiversity conservation to economic development. This plan should then be used to attract donor funding.

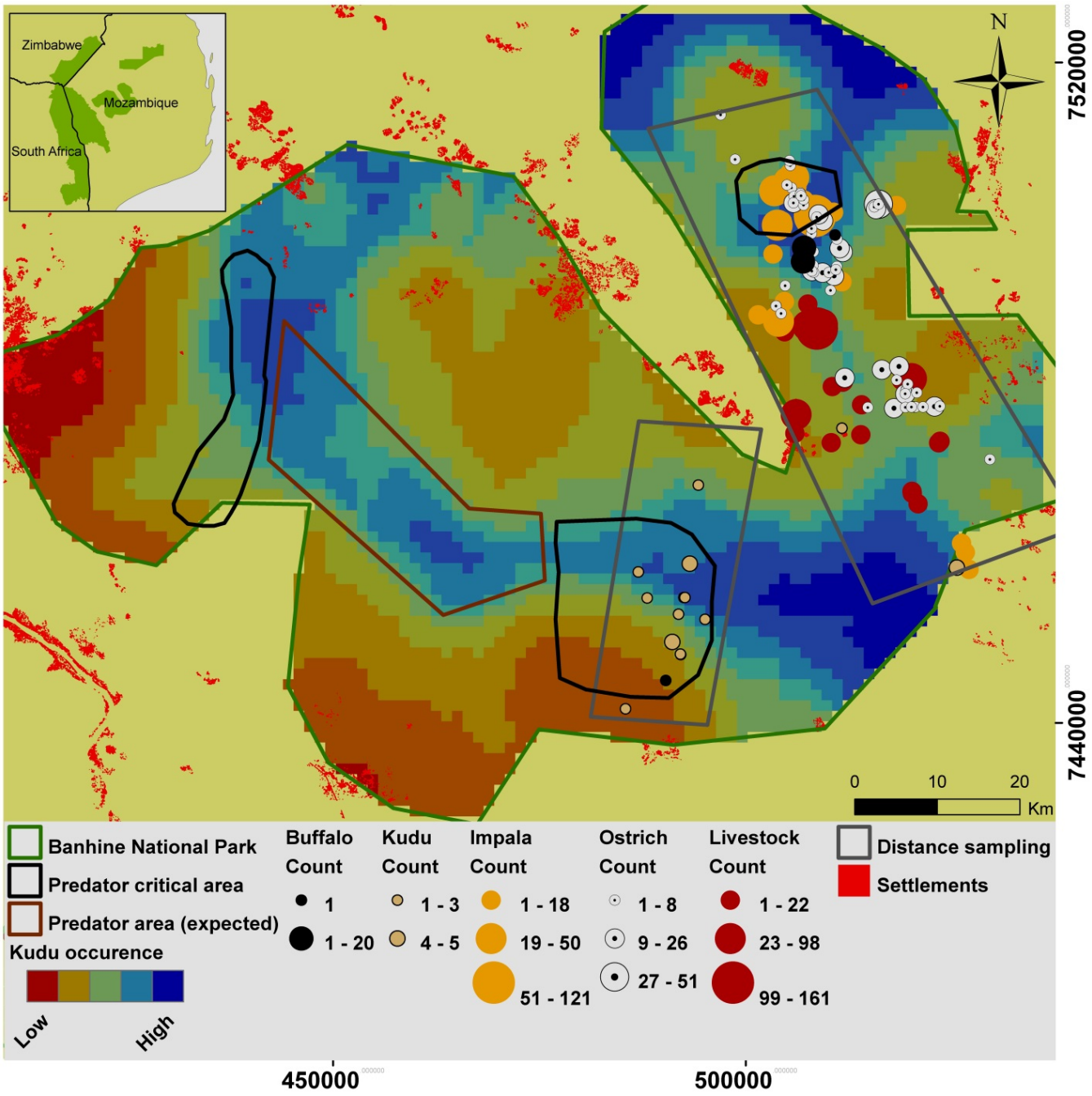

Figure 4: Critical predator areas and prey base in Banhine National Park. Critical predator areas are locations we found predator sign; the expected predator area has not yet been surveyed but shares important characteristics with critical predator areas**;** kudu occurrence is from logistic regression model of detections from occupancy surveys; locations where distance sampling was conducted and counts of ungulates.

The Limpopo-Banhine Corridor Concept

Conservation corridors are lands that permit wildlife movement between protected areas (Soule & Gilpin, 1991). Maintaining natural dispersal between protected areas is important for population viability and the conservation of biodiversity and ecosystem function (Rosenburg *et al*., 1997). Cheetah, lion and wild dog are key species to consider in corridor planning because they are:

I. Globally recognized as high conservation concern
II. Wide-ranging but with highly fragmented populations
III. Important for ecosystem function
IV. High value for tourism
V. Important flagships for conservation

Preliminary findings: Limpopo-Banhine Corridor

We documented considerable human-impacts in the potential corridor areas between Limpopo and Banhine National Parks; the greatest barrier to wildlife movement appears to be a continuous band of agricultural settlements along both sides of the Limpopo River. However, we did find evidence of wild ungulates in some areas; including duiker on 42 %, kudu on 25 %, steenbok on 11 %, bushpig on 8 %, nyala on 7 %, and warthog on 4 % of 1 km trail segments surveyed, respectively. We also found sign of elephant on 4 % of trail segments surveyed. That some potential corridor areas support low densities

of wild ungulates is extremely promising because these areas may permit predator dispersal; however, wild ungulate populations are likely rapidly diminishing with rising human impacts. It is crucial that conservation corridors that permit the dispersal of threatened predators are secured if Limpopo and Banhine National Parks are to properly function together, and thereby contribute to the conservation of biodiversity and local economic development. To assist with the corridor planning process, we are providing preliminary information on critical predator areas in both National Parks, and on the occurrence of wild ungulates (Figure 2). Based on these preliminary results, we have indicated two areas that have the highest likelihood of functioning as corridors for apex predators (Figure 2). Elephant are also an important species to consider in corridor planning because they share the same characteristics listed above. Based on our preliminary results, the areas that we have indicated also have the highest likelihood of functioning for elephant (Appendix 2). The prospects of sustainable wildlife-based economic development in the demarcated corridors should be explored.

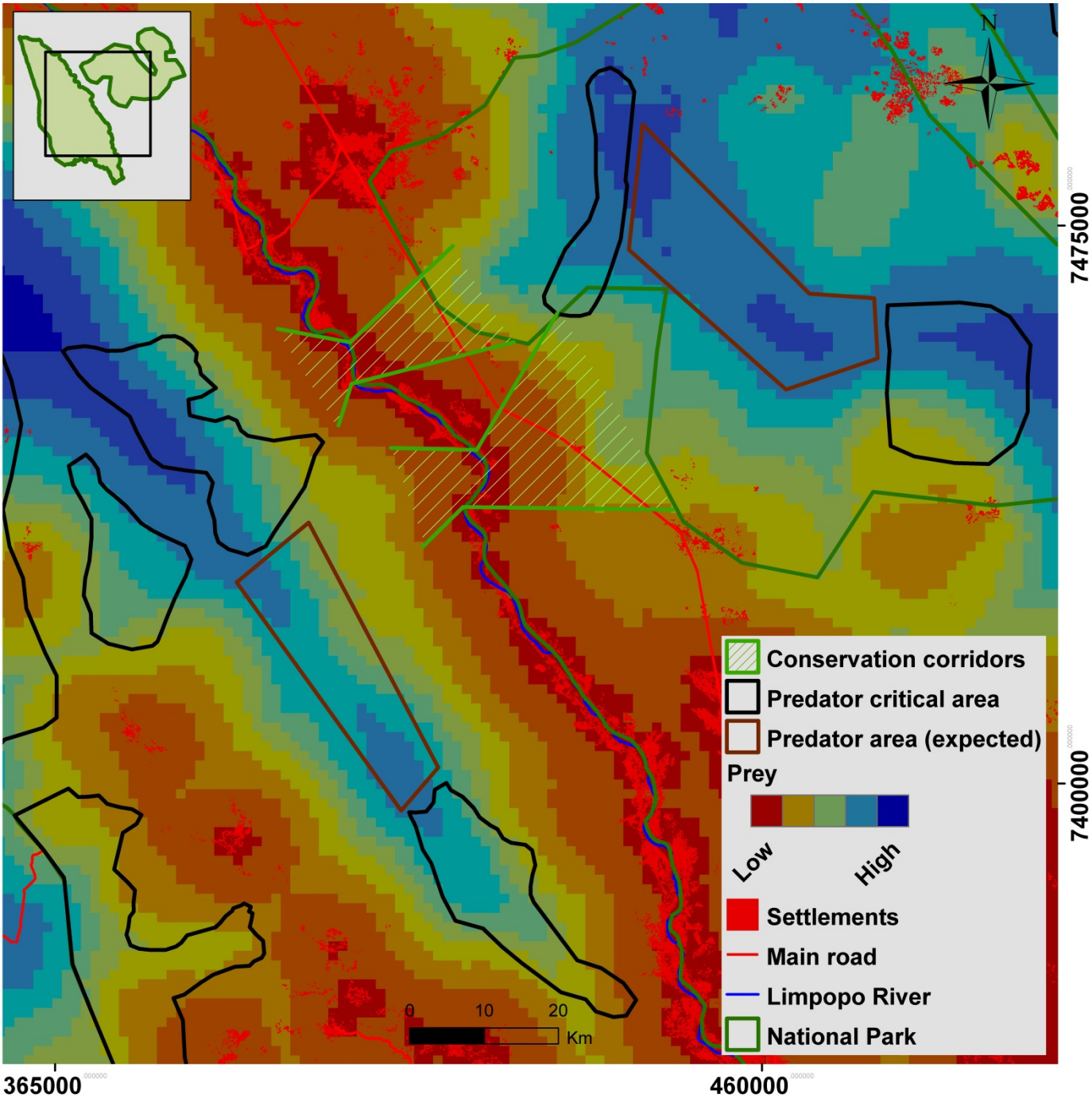

Figure 2: Recommended Limpopo-Banhine conservation corridor, identified as area with the highest likelihood of facilitating apex predator connectivity. Assessment is based on critical areas for cheetah, lion and African wild dog (this study), and occurrence of important prey from logistic regression model (this study) and human land-use. Expected predator areas have not yet been surveyed but share important characteristics with critical predator areas.

Acknowledgements

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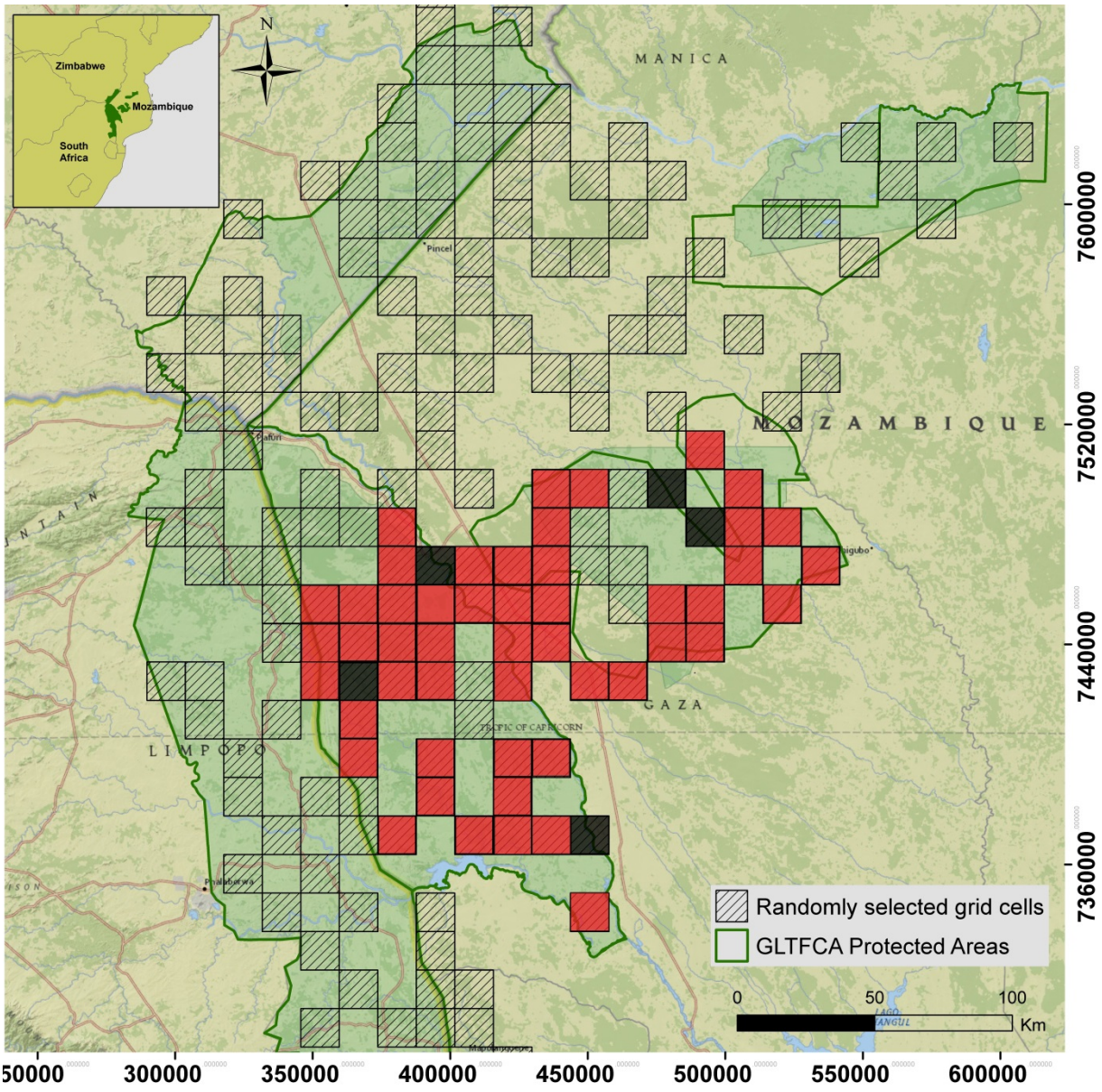
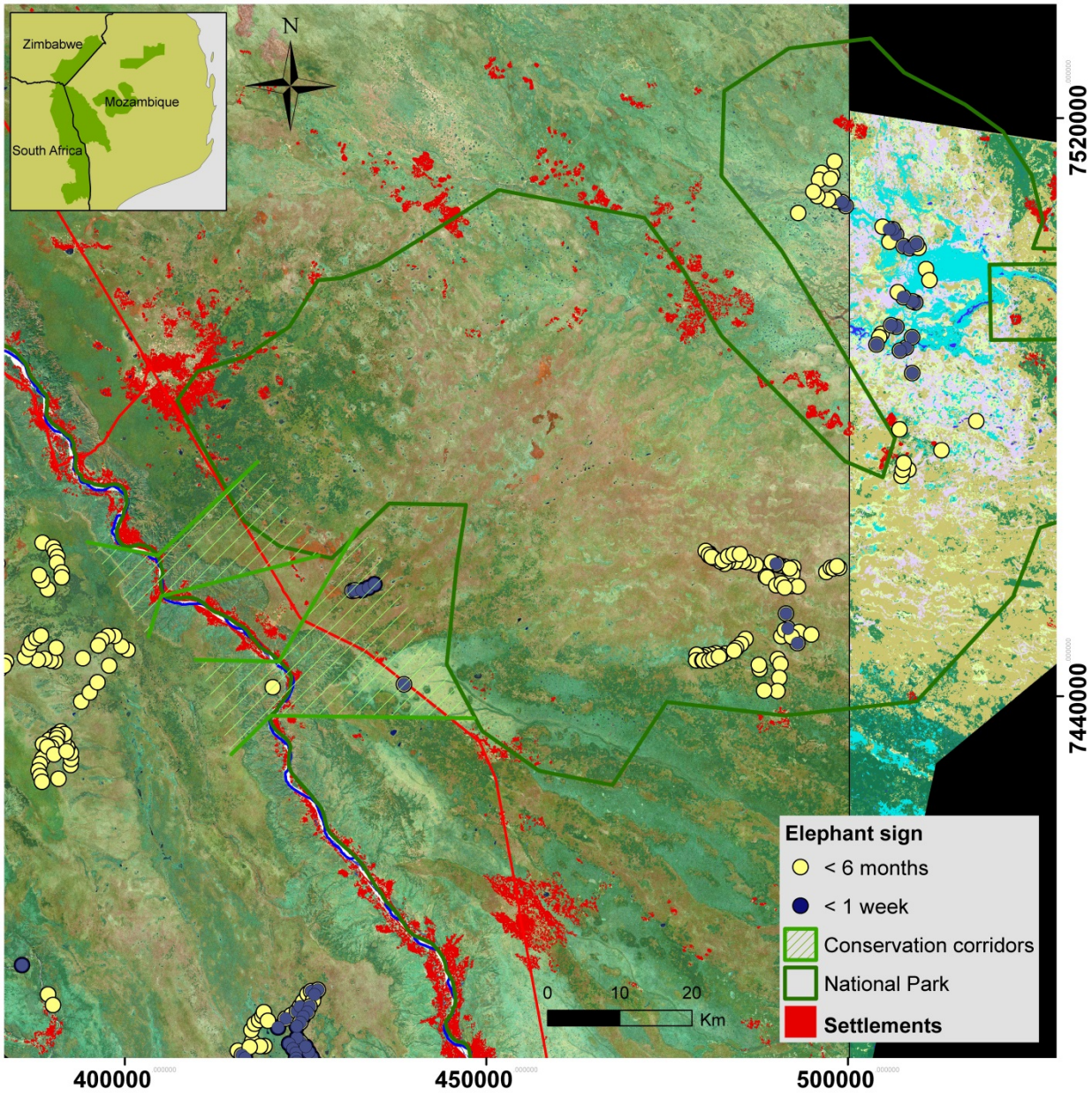
Appendix 1



The Greater Limpopo Transfrontier Conservation Area of South Africa, Mozambique and Zimbabwe, showing 150 randomly selected 200 km^2 grid cells (shaded and coloured); cells sampled in 2014-2015 (red); and cells removed from sampling because they contained >80% human settlements (black).

Appendix 2



Elephant sign recorded in the Limpopo and Banhine National Parks and adjacent areas during 2014-2015.