

SW249 Factors affecting the population size and distribution of large mammals in the Waterberg Biosphere Reserve, South Africa

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Introduction

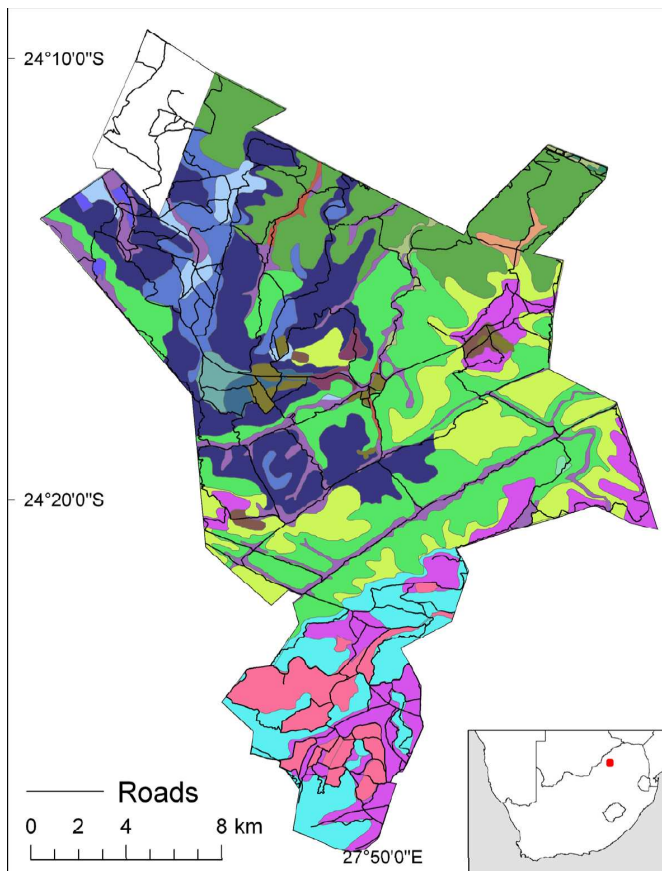
Welgevonden is a privately owned reserve that covers 37,500 hectares of South Africa's Waterberg Biosphere between the towns of Vaalwater and Lephalale. Welgevonden was formed using a novel funding mechanism. The 37,500ha reserve, some of which was game ranch and some farmland, was bought by a developer, fenced and stocked with game. 61 blocks of 500ha each were then sold off to private investors who had the rights to build a lodge on the land and to traverse with a single vehicle across the whole reserve. Monthly payments are then made by each of the landowners to manage the reserve. This form of private but joint ownership has succeeded in creating a substantial reserve without the problems normally encountered with separate landowners having separately fenced areas and may perhaps provide a model for private investment to create substantial new areas of land under conservation.

The reserve is home to over 50 different mammals, including the big 5 (lion, leopard, elephant, rhino and buffalo). Some of the terrain in the reserve is mountainous, with plateaus and open plains in the higher lying regions. Due to the acidic nature of the soil, the predominating vegetation in these areas is tall grass with low nutritional value that can only support small numbers of herbivores (Andrews & O'Brien, 2000; Walgren et al., 2009). Some areas of the reserve have dense thickets of shrubs and trees and other areas of the reserve which were previously used for farming, have more nutrient rich soil and host other grassland species. The land areas of Welgevonden have been classified into nine different types; riparian, plateau, valley bottom, hill slope, saddle, crest/summit, marsh, old farmlands and old overnight cattle storage lands. The reserve can further be divided into a range of different vegetation community types determined by the predominate vegetation (Figure 1). There are three rivers which transect the reserve and combine at the Limpopo River.

Lions were introduced in 1998 into Welgevonden in response to pressure from the landowners to increase the tourism value of the site. The low nutrient grasslands of Welgevonden reduces the carrying capacity of the reserve for large herbivores (Walgren et al., 2009) and this coupled with an increasing lion population significantly reduces the herbivore populations to the extent that additional herbivore stocking had to be undertaken annually. The lion population has now been reduced but annual restocking of herbivores is still being undertaken until the system can be brought into balance. One of the key management information requirements for this site is data on the habitat usage of the reserve over the year and the birthing and survival rates and herd structure of antelope and zebra (preferred prey of lions: Druce et al., 2004).

In addition, the reserve management team is particularly interested in their elephant and rhino population dynamics. In the last year, there has been an increase in rhino poaching across South Africa. The Welgevonden reserve has increased security in the sections of the reserve that are accessible by road where risk of poaching is highest, but these efforts must be combined with detailed monitoring of the abundance, population structure and distribution patterns of the rhino. Monitoring elephant abundance, habitat use and ranging is very important in terms of land management as it is already well documented that elephants have a serious impact on their habitat (c.f. Mapoure & Moe, 2009). There are 8 herds of elephant in

the reserve and the matriarchs of two of these herds were fitted with GPS collars in 2004. The reserve management is therefore keen to investigate elephant movement patterns in relation to habitat using the positional data provided by these collars and field observations.



Vegetation types






















	Burkea africana/ Setaria pallide-fusca open woodland Terminalia sericea subcom.
	Burkea africana/ Chrysopogon serrulatus/ Schizachirium sanguineum open woodland Terminalia sericea s
	Burkea africana/ Setaria pallide-fusca open woodland Faurea Saligna subcom.
	Burkea africana/ Setaria pallide-fusca open woodland Terminalia sericea subcom.
	Burkea africana/ Trachypogon spicatus/ Diheteropogon amplexans open woodland Terminalia sericea sub
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	Burkea africana/ Trachypogon spicatus/ Schizachirium sanguineum open woodland Terminalia sericea subc
	Burkea africana/ central grassland open woodland Faurea Saligna subcom.
	Burkea africana/ central grassland open woodland Terminalia sericea subcom.
	Central Grasslands
	Mixed Burkea africana/ Chrysopogon serrulatus/ Melinis repens woodland Diplorynchus
	Mixed Burkea africana/ Chrysopogon serrulatus/ Schizachirium sanguineum woodland Diplorynchus
	Mixed Burkea africana/ Trachypogon spicatus/ Diheteropogon amplexans woodland Diplorynchus condyloc
	Mixed Burkea africana/ Trachypogon spicatus/ Diheteropogon amplexans woodland Englerophytum
	Mixed Burkea africana/ Trachypogon spicatus/ Schizachirium sanguineum woodland Diplorynchus condyloc
	Northern Grasslands
	Southern Grasslands
	Trachypogon spicatus/ Diheteropogon amplexans Rocky plateau open woodland
	Trachypogon spicatus/ Melinis repens Rocky plateau open woodland
	Trachypogon spicatus/ Schizachirium sanguineum Rocky plateau open woodland
	Western Grasslands

Figure 1: Distribution of Vegetation types in Welgevonden Private Game Reserve
Bearing in mind the key issues faced by the Welgevonden reserve management team, the primary research objectives of the Operation Wallacea project are:

1. To monitor the abundance and distribution of antelope and zebra in relation to habitat
2. To monitor birth and first year survival rates, and changes to herd structure of antelope and zebra over time in response to environmental variables
3. To monitor elephant ranging and habitat preferences using visual surveys and data from GPS collars
4. To monitor rhino ranging and habitat preferences using visual surveys, and changes to population dynamics over time in response to environmental variables
5. To compare population density estimates of large mammals from game counts along transect lines in the reserve to yearly census data collected via aerial surveys

Research Design

Students will be divided into two groups that will alternate between field and camp activities on a daily basis (i.e. 1 day in the field collecting data followed by one day in camp then one day in the field, followed by one day in camp and so on). During days in camp, students will be expected to attend lectures and practicals on African conservation, complete their data entry and assist with the creation of Rhino ID kits from photographs they have taken while in the field. The data collected by students is part of a long-term population monitoring and land management project and thus all students joining the Opwall expedition to Welgevonden are expected to pitch in and assist with all data collection rather than focussing solely on the data required for their project. In exchange for assisting the reserve management with their

conservation project, students will have access to the long-term data sets that belong to the reserve and may use them for their research projects.

Data Collection

Large mammal populations will be monitored via game vehicle using distance sampling (Buckland et al 2001) along six 10km long line transects that coincide with reserve road network (300km in total). The transect lines in total will incorporate all of the nine different habitat types (some transects will cover only one habitat type while others will cover multiple habitat types). Transect lines will also incorporate areas close to human activity (tourist lodges) and more remote areas of the park. Each transect will be sampled a minimum of four times. Students will travel along the transect line at a steady pace and record their encounters with herbivores. Each time an animal is seen, the species will be identified, the number of individuals recorded, the distance along the transect line, the GPS location of the animals (calculated from the GPS location of the vehicle and the distance and direction of the animals to the vehicle), and the habitat type will be recorded in addition to the perpendicular distance of the animal from the observer when first encountered. The large mammal species commonly encountered during surveys include elephant, eland, red hartebeest, impala, kudu, reedbuck, rhino, waterbuck, wildebeest and zebra. GPS and habitat data can be combined with existing GIS maps of the reserve and used to investigate ranging and habitat use of specific species. Distance sampling may be used to create population estimates of specific species.

References

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