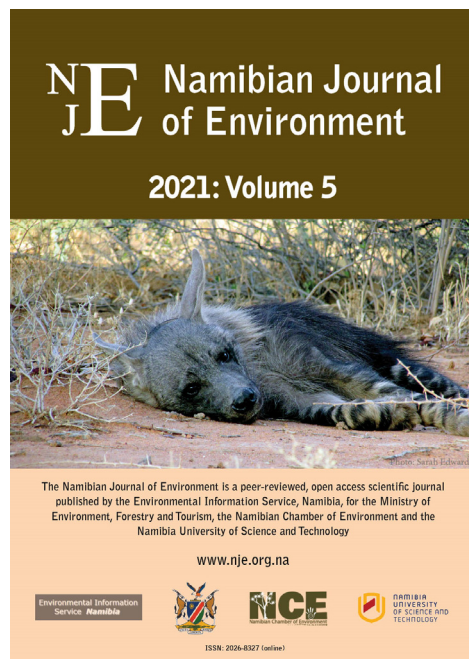# Namibian Journal of Environment

The *Namibian Journal of Environment* (NJE) covers broad environmental areas of ecology, agriculture, forestry, agro-forestry, social science, economics, water and energy, climate change, planning, land use, pollution, strategic and environmental assessments and related fields. The journal addresses the sustainable development agenda of the country in its broadest context. It publishes four categories of articles: **Section A: Research articles**. High quality peer-reviewed papers in basic and applied research, conforming to accepted scientific paper format and standards, and based on primary research findings, including testing of hypotheses and taxonomical revisions. **Section B: Research reports**. High quality peer-reviewed papers, generally shorter or less formal than Section A, including short notes, field observations, syntheses and reviews, scientific documentation and checklists. **Section C: Open articles**. Contributions not based on formal research results but nevertheless pertinent to Namibian environmental science, including opinion pieces, discussion papers, meta-data publications, non-ephemeral announcements, book reviews, correspondence, corrigenda and similar. **Section D: Memoirs**. Peer-reviewed monographic contributions and comprehensive subject treatments (> 100 pages), including collections of related shorter papers like conference proceedings.

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SECTION C: OPEN ARTICLES

Recommended citation format:

Cover photo: Sarah Edwards

Vegetation types and structure in the Kanovlei State Forest in Namibia

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Abstract

Vegetation mapping of the Kanovlei State Forest was carried out in 2010 using a combination of Landsat Etm+ satellite image data and field data. Eight vegetation types were identified: closed woodland, dense shrubland, mixed grass and shrubland, mixed shrubland, mixed shrubland and woodland, open woodland, shrubland, and woodland. The dominant woody species in the area were *Pterocarpus angolensis*, *Burkea africana*, *Acacia* (*Vachellia*) species, *Terminalia sericea*, *Bauhunia petersiana* and *Combretum* species. Soil types were also mapped. Most of the area is sandy soil.

Keywords: Kanovlei State Forest, Namibia, remote sensing, soil mapping, vegetation structure, vegetation type
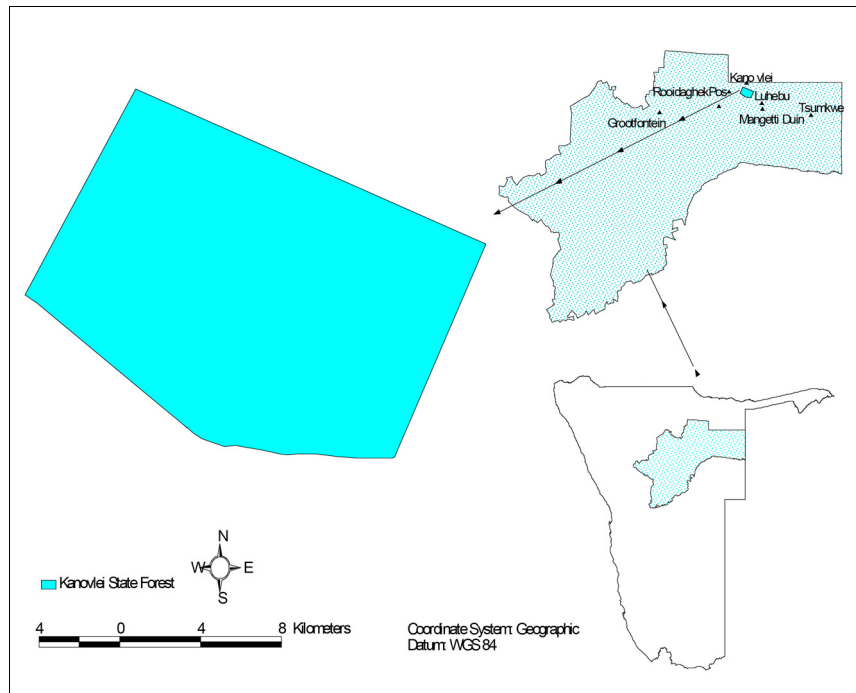
Introduction

The Kanovlei State Forest is in Namibia's Otjozondjupa region (Figure 1). It lies approximately 150 km east of Grootfontein and covers about 21 636 hectares. The area has been a protected reserve for more than 20 years and human activities have been limited in the area. This study aimed to create a detailed map of vegetation structure and communities, as well as of soil types.

Methods

ERDAS IMAGINE was used for image processing, while vector data were processed and generated using ArcView GIS 3.2 (a), ARCGIS 9.3.1 and OziExplorer. Landsat ETM + (2002) images were used to allocate sample plots. A random sampling method was used to demarcate

Figure 1: Kanovlei State Forest. The co-ordinates of the north-western corner are -19°14'15", 19°23'15" and the south-eastern corner is at -19°17'25", 19°36'15".

approximately 20 sample plots. Satellite images for each sample plot were printed and used in the field to identify vegetation types. Field data were recorded to match vegetation types with distinct reflectance in the image. The co-ordinates of sample points were recorded with a GPS. Vegetation type, soils and dominant plant species were recorded at each sample point.

Different vegetation cover classes were defined to reflect both vegetation structure and woody plant species dominance. Vegetation classes were then mapped using a supervised maximum likelihood classification based on training sites delimited from the field data. The classes emphasised distinct vegetation structure and community dominance.

Results and Discussion

Eight vegetation structure classes were identified: closed woodland, dense shrubland, mixed grass and shrubland, mixed shrubland, mixed shrubland and woodland, open woodland, shrubland, and woodland (Figure 2). The closed woodland, woodland and shrubland covered most of the State Forest while the remaining classes contributed smaller proportions of the vegetation cover. No grassland areas were found.
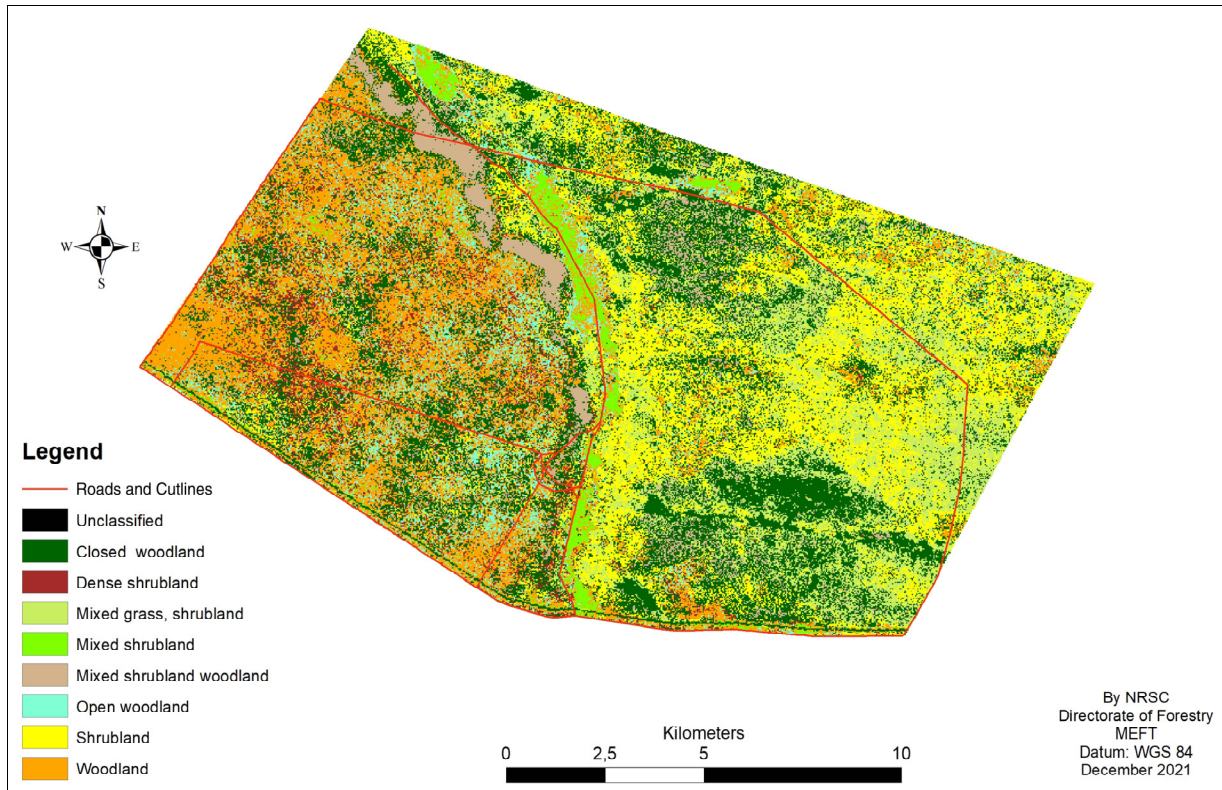
Figure 2: *Vegetation structure in the Kanovlei State Forest.*

Pterocarpus angolensis and *Burkea africana* were the dominant woody species (Figure 3). *P. angolensis* was mostly found in the western part of Kanovlei while the eastern part was dominated by *B. africana*. Along the dry drainage lines and valleys (locally called omurimba; singular omuramba), *Acacia* spp., *B. africana* and *Terminalia sericea* were dominant while a few other areas were dominated largely by *Bauhunia petersiana* and *Combretum* spp. Other species in the area were relatively scarce and not mapped.

Much of the area consists of sandy soil while small areas along the main omuramba are comprised of sandy loam (Figure 4). Soil and vegetation types appeared to be linked. For example, *T. sericea* was normally on sandy soils. while thorny plants such as *Acacia* spp. and *Ziziphus mucronata* grew predominantly on sandy loam.

Although the mapping exercise was carried out more than 10 years ago, the results remain relevant since humans and wildlife have had little impact on vegetation resources. We encourage natural resource managers to use this baseline vegetation information to monitor the impacts of conservation and other land uses in the Kanovlei State Forest.
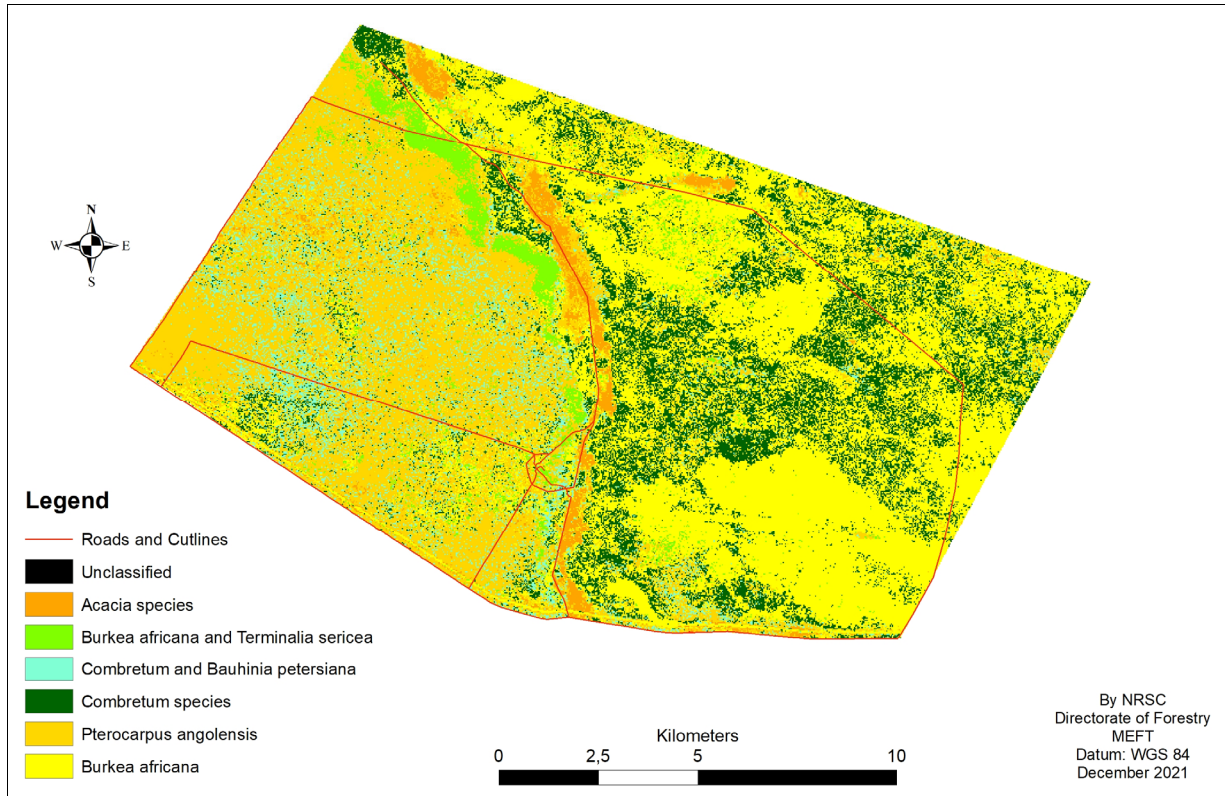
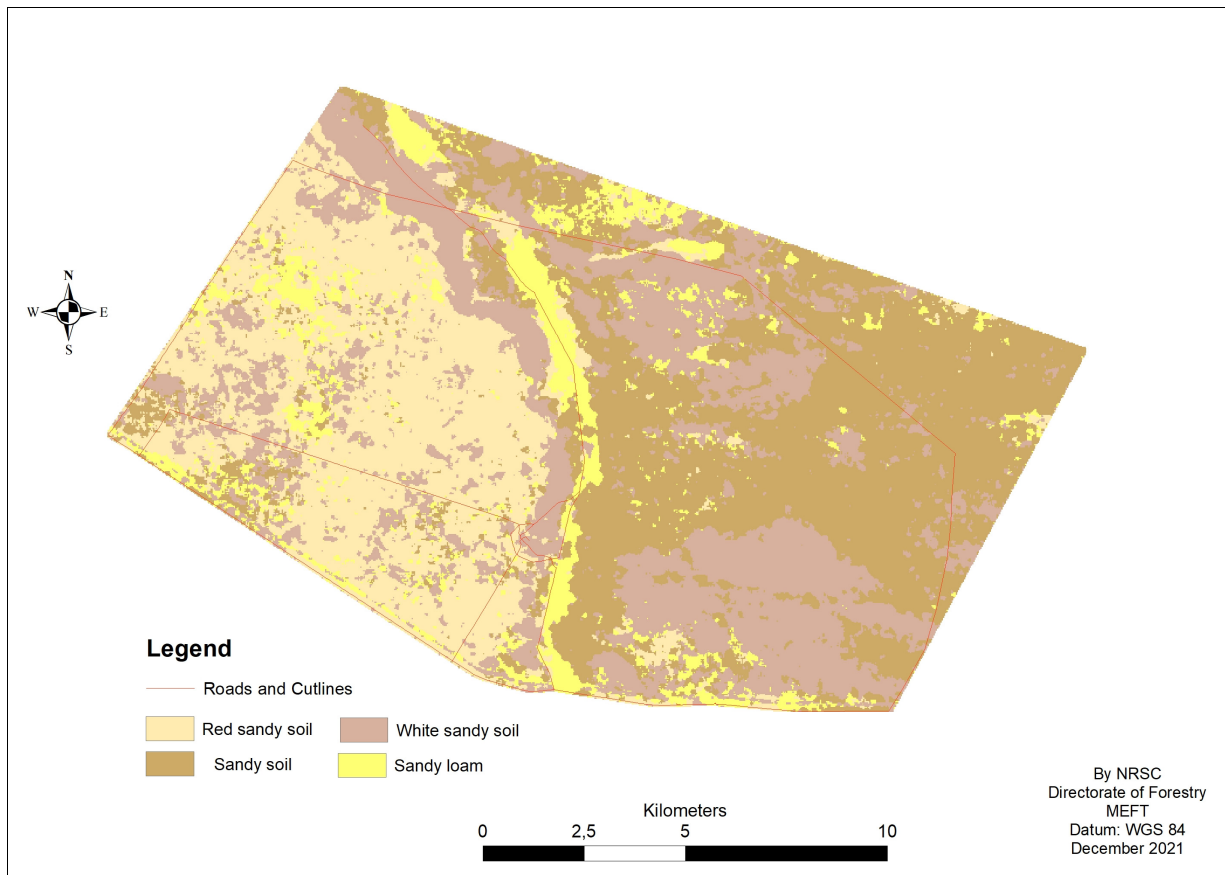**Figure 3:** *Dominant vegetation species in the Kanovlei State Forest.*

Figure 4: *Soil types in the Kanovlei State Forest.*