INTRODUCTION

The management of a game ranch should be conducted under sound ecological principles involving both conservation and preservation (Bothma, 1996). One of the most important aspects is to understand the behaviour and dynamics of the populations on a ranch in order to manage them better.

HABITAT SELECTION

The objectives of conducting this study were to:

1. Determine the preferred habitat of the following herbivores:
    - Impala, *Aepyceros melampus*
    - Burchell's zebra, *Equus burchellii*
    - Blue wildebeest, *Connochaetes taurinus*
    - Blesbok, *Damaliscus pygargus phillipsi*
    - Gemsbok, *Oryx gazella*
    - Giraffe, *Giraffa camelopardis*
    - Kudu, *Tragelaphus strepsiceros*
    - Eland, *Taurotragus oryx*
2. Determine if the preferred habitat of the aforementioned herbivores changes with the seasons
3. Plot the movements of each species
4. Give management recommendations using the results

POPULATION DYNAMICS

The six objectives of the survey were to:

1. Determine the sex ratio of the following herbivores
    - Impala, *Aepyceros melampus*
    - Burchell's zebra, *Equus burchellii*
    - Blue wildebeest, *Connochaetes taurinus*
    - Giraffe, *Giraffa camelopardis*
    - Kudu, *Tragelaphus strepsiceros*

2. Determine the age structure of the selected animals
3. Determine if the herd sizes of the selected animals change with the seasons
4. Make management recommendations using results

THE STUDY AREA

INTRODUCTION

Location and size

Sondela Nature Reserve is situated between latitude 24° 50` 40`` and 24° 55` 40`` S, and longitude 28° 21` 35`` and 28° 27` 04`` E in the Limpopo Province of South Africa. The closest town is Bela-Bela, which is 7 km away (Figure 1).

Sondela Nature Reserve is part of Adinvale (Pty) Ltd. Adinvale has a wide range of land uses which include game ranching, domestic farming and tourism. The largest land use zones are Sondela Nature Reserve at 1410 ha, a cattle ranch at 2260 ha and a bushcamp at 370 ha. The cattle ranch lies adjacent to Sondela Nature Reserve, while the bushcamp lies on the opposite side of the N1 highway (Figure 2).

Sondela Nature Reserve is part of the RCI timeshare group and has 50 chalets with six beds in each. The activities on offer include horse riding, mountain biking, game drives, archery and clay pigeon shooting. The majority of guests visiting Sondela Nature Reserve are South African.

Vegetation

Acocks (1998) classified this region as the boundary of the Springbok Flats Turf Thornveld (Veld Type 12) and the Sourish Mixed Bushveld (Veld Type 19), while according to Low and Rebelo (1996), Sondela occurs on the boundary of the Clay Thorn Bushveld (Vegetation Type 14) and the Mixed Bushveld (Vegetation Type 18).

The vegetation of the reserve was classified by van Wijk (1996) by means of the Braun-Blanquet method (Werger 1974). The whole farm was classified into five communities, two of which have two sub-communities each, and one which has one sub-community with three variations (Figure 3). For the purpose of the study, only the communities on the Nature Reserve needed to be included (Table 1).

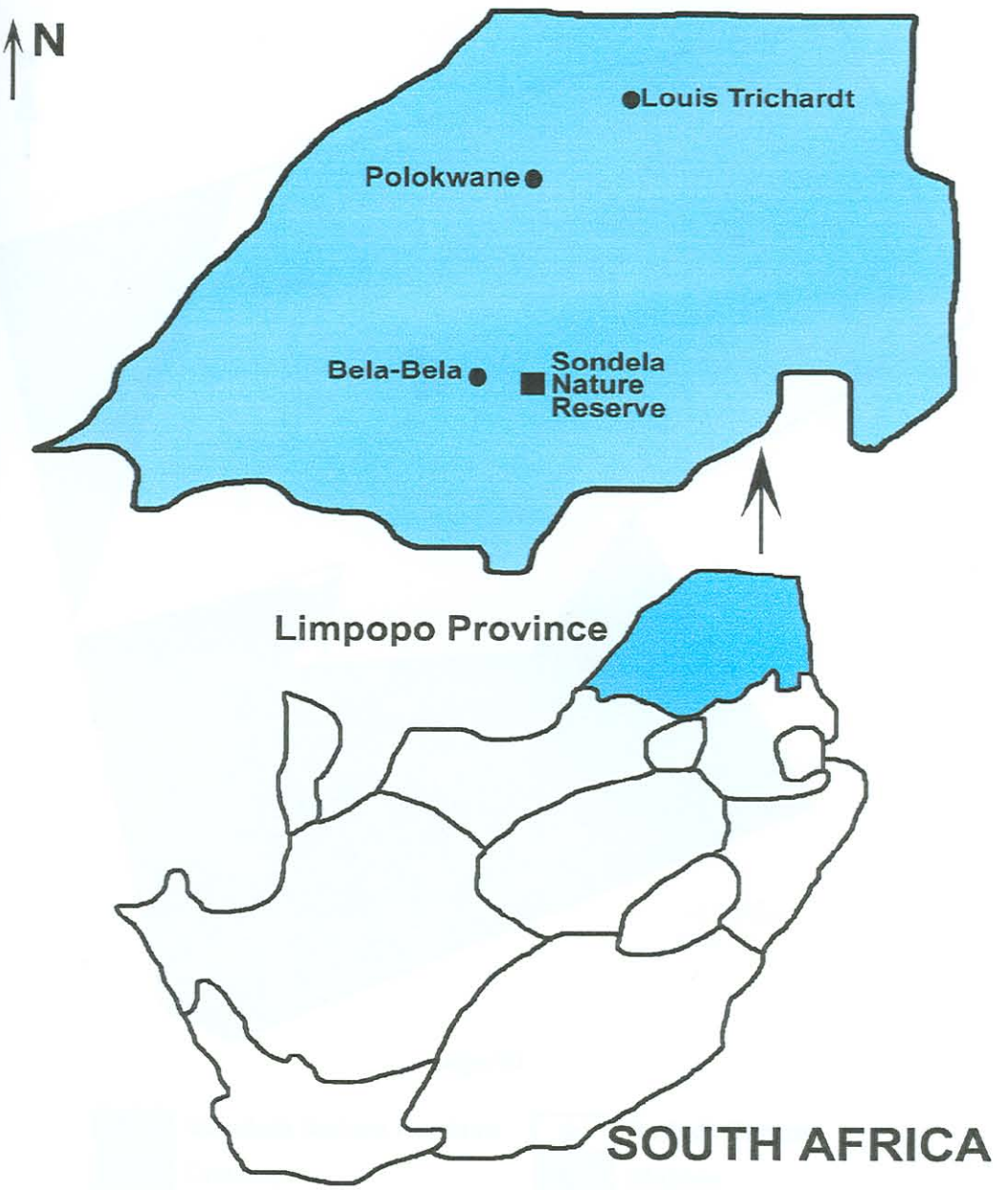


Figure 1: Map indicating the location of Sondela Nature Reserve

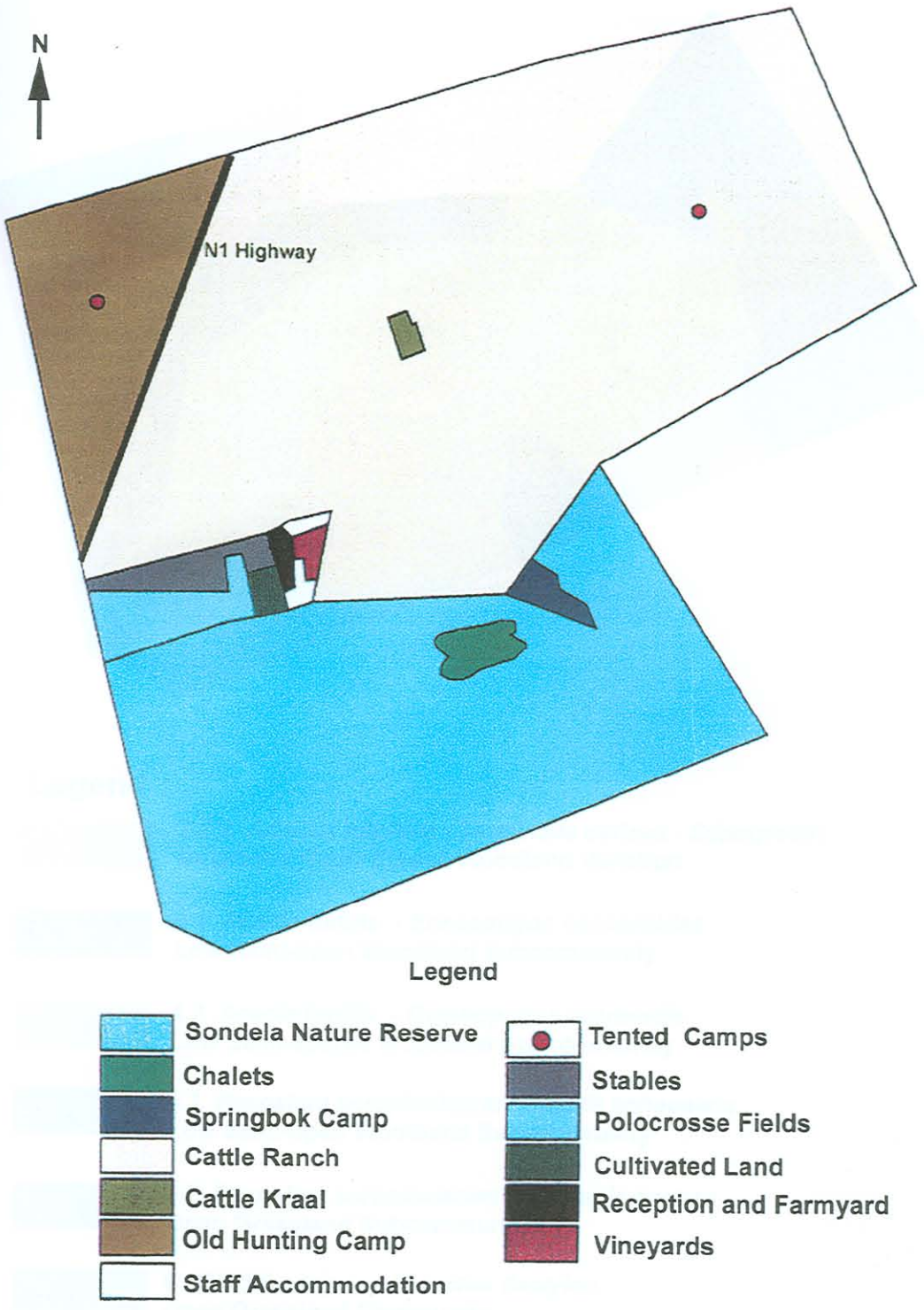
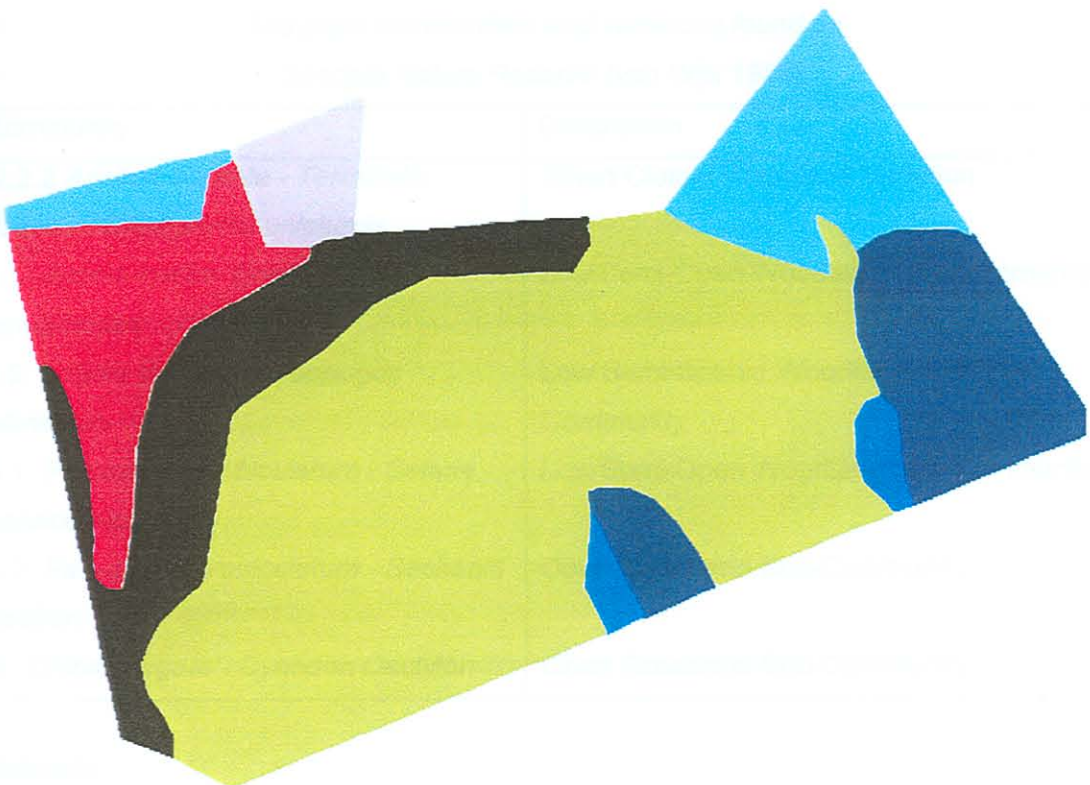


Figure 2: The land use zones of Adinvale



Legend

- 2.2.2 *Aristida stipitata - Terminalia sericea - Stipagrostis uniplumis* Short Closed Woodland Variation
- 4.1 *Acacia tortilis - Enneapogon cenchroides* Low Semi-open Woodland Subcommunity
- 4.2 *Acacia tortilis - Cymbopogon plurinodis* Low Semi-sparse Woodland Subcommunity
- 5.1 *Paspalum scrobiculatum - Setaria sphacelata* Low Semi-open Woodland Subcommunity
- 5.2 *Paspalum scrobiculatum - Sesbania sesban* Open Grassland Subcommunity
- 6. *Chloris virgata - Cynodon dactylon* Open Grassland Community

Figure 3: Plant communities found on Sondela Nature Reserve

Table 1

The plant communities and variations found on Sondela Nature Reserve (van Wijk 1996).

Community	Description
2.2.2 *Aristida stipitata - Terminalia sericea - Stipagrostis uniplumis*	Short Closed Woodland Variation
4.1 *Acacia tortilis- Enneapogon cenchroides*	Low Semi-Open Woodland Sub-Community
4.2 *Acacia tortilis- Cymbopogon plurinodis*	Low Semi-Sparse Woodland Sub-Community
5.1 *Paspalum scrobiculatum - Setaria sphacelata*	Low Semi-Open Woodland Sub-Community
5.2 *Paspalum scrobiculatum - Sesbania sesban*	Open Grassland Sub-Community
6. *Chloris virgata - Cynodon Dactylon*	Open Grassland Sub-Community

Animals

At present there is a wide variety of ungulates on Sondela, including:

Blesbok, *Damaliscus pygargus phillipsi*
Impala, *Aepyceros melampus*
Giraffe, *Giraffa camelopardis*
Gemsbok, *Oryx gazella*
Eland, *Taurotragus oryx*
Blue wildebeest, *Connochaetes taurinus*
Waterbuck, *Kobus ellipsiprymnus*
Burchell's zebra, *Equus burchellii*
Kudu, *Tragelaphus strepsiceros*
Red hartebeest, *Alcelaphus buselaphus*

There are no large predators on Sondela and no members of the big five, but the following smaller predators are found:

Black-backed jackal, *Canis mesomelas*
Brown hyaena, *Hyaena brunnea*
Caracal, *Felis caracal*
Aardvark, *Orycteropus afer*

Topography

Sondela ranges in altitude from 1120 m above sea level in the south, to 1200m above sea level in the North-west. The surface is predominantly flat with a mean slope of 3.3°. There are no perennial water sources and no major drainage lines on the farm.

Climate

Sondela falls into the Southern Savanna biome and is subjected to a typical unimodal subtropical Savanna climate with a single summer rainy season. Climatic data was obtained from the Towoomba Weather Station (station number 0589 / 5941; longitude 24° 54` S; latitude 28° 20` E; 1120m above sea level), 4 km west of Sondela.
The rainfall is erratic and varies from year to year. The average rainfall in this area is 61 mm for the period March 1998 to February 1999. The wet season stretches from October to April, with November and December being the wettest months with measurements of 193.5 mm and 248.4 mm respectively. The dry season stretches from May to September (Figure 4).

The average maximum yearly temperatures measured on Sondela is 28° Celsius (Figure 5), while the average minimum yearly temperature measured on Sondela is 11° Celsius (Figure 6). Extreme temperatures are not uncommon and can reach 30° Celsius in summer and drop to as low as 2° Celsius in winter.

Geology

There is one major rock type found on Sondela Nature Reserve and this type forms part of the Karoo Sequence. This type is known as the Letaba formation, which has a sedimentary column of volcanic rock and sandstone and an igneous column of basalt and pyroclasts. The result of this parent rock is shallow, high clay, nutrient rich soils.

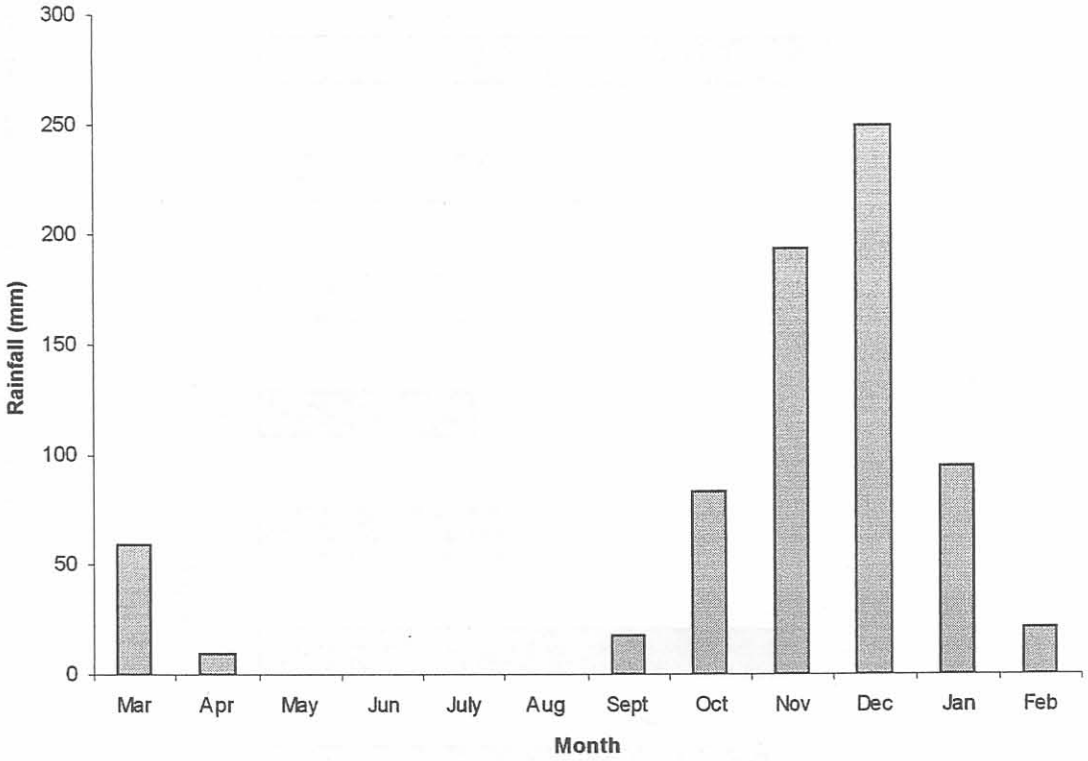


Figure 4. Monthly rainfall for Sondela Nature Reserve from 1999 to 2000 as determined from the data of the Towoomba weather station, number: 0589594 1; Latitude: 2454; Longitude: 2828; Height: 1143m ASL (Weather Bureau, unpublished)

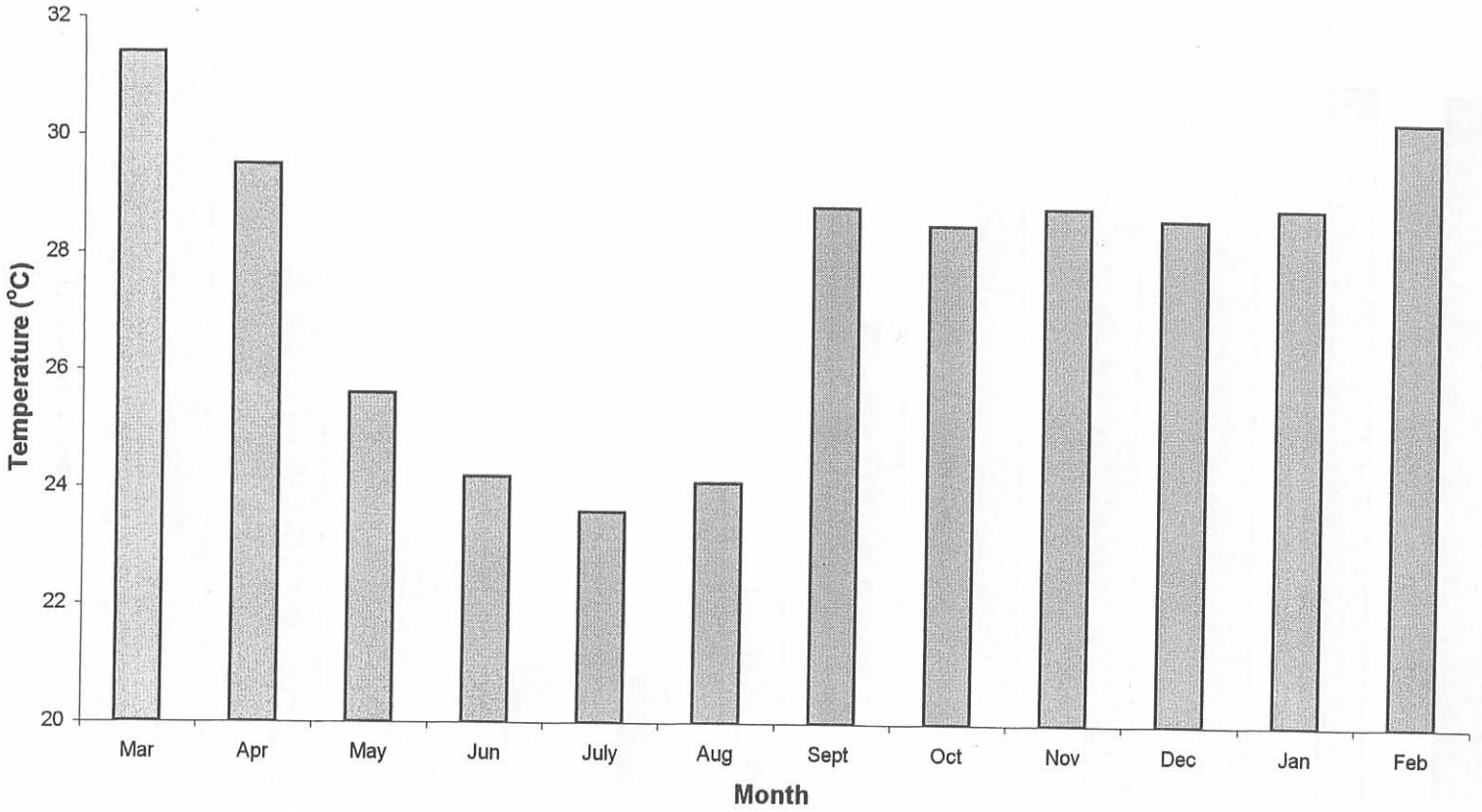


Figure 5. Monthly maximum temperature for Sondela Nature Reserve from 1999 to 2000 as determined from the data of the Towoomba weather station, number: 0589594 1; Latitude: 2454; Longitude: 2828; Height: 1143m ASL (Weather Bureau, unpublished)

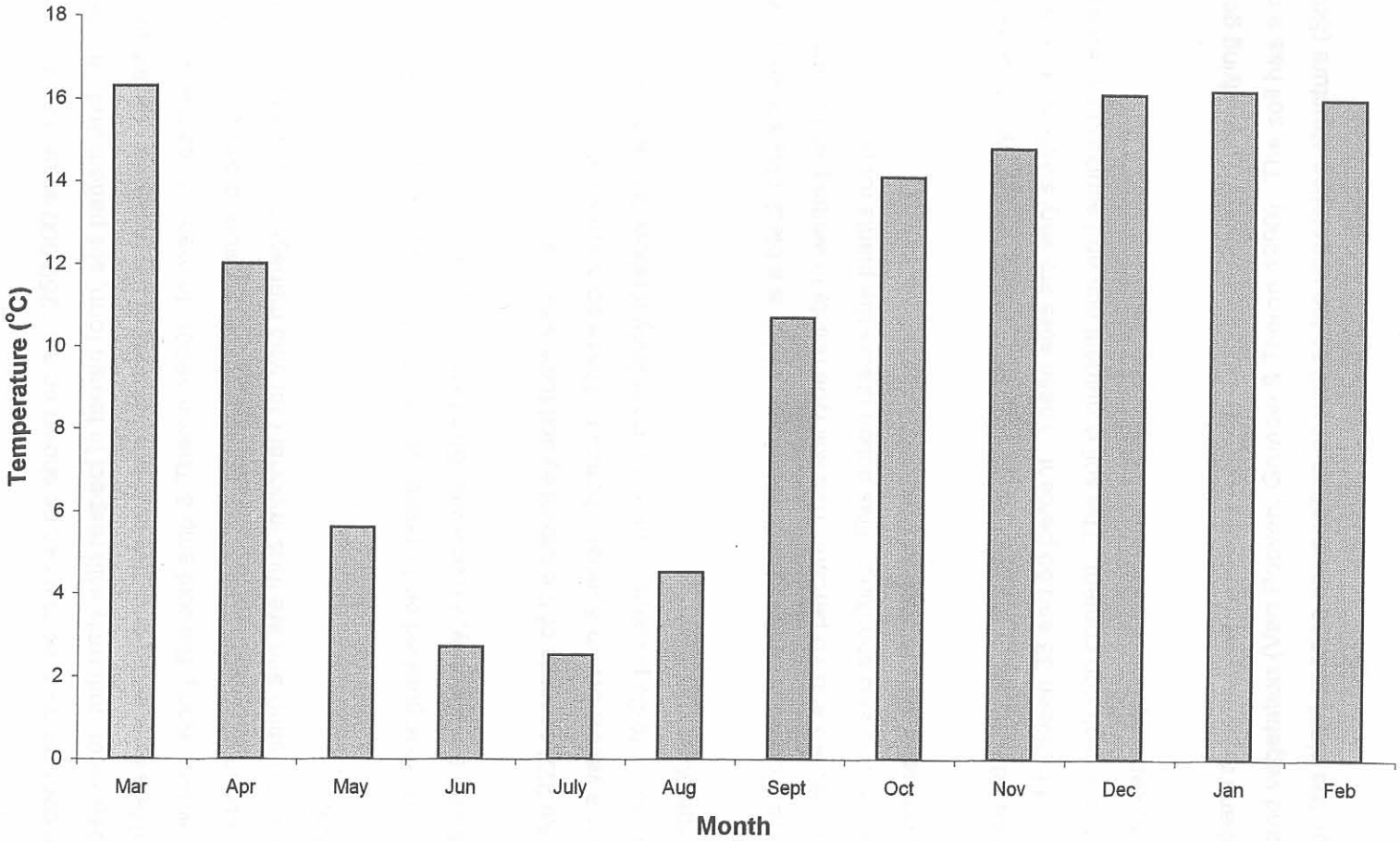


Figure 6. Monthly minimum temperature for Sondela Nature Reserve from 1999 to 2000 as determined from the data of the Towoomba weather station, number: 0589594 1; Latitude: 2454; Longitude: 2828; Height: 1143m ASL (Weather Bureau, unpublished)

Landtypes and soils

A land type denotes an area that can be shown on a 1 : 250 000 scale map and displays a marked degree of uniformity with respect to terrain form, soil pattern and climate. One land type differs from another in terms of one or more of the following: terrain form, soil pattern or climate (Kooij, Bredenkamp & Theron 1990). In many cases these categories give an indication of nutrient status and patterns of soil moisture drainage and soil moisture accumulation and are thus important for veld management (Van Rooyen & Theron 1996).

The land types distinguished on Sondela are Ae 222, Ea 1 and Ae 18, while the three soil types found are Clovelly, Arcadia and Shortlands (Figure 7).

Land type Ae 222 consists of the Clovelley soil form, which is comprised of an Orthic A horizon over a yellow-brown Apedal B horizon. These soils are sandy loam soils with a clay content of 15 to 20 percent. This soil form is fairly shallow, but does support sourveld vegetation.

Land type Ea 1 consists of the Arcadia soil form, which is a black clay soil with clay content between 45 and 70 percent. This soil type reacts to wetting and drying by continuous swelling and shrinking. This action cracks the plants roots and thus vegetation on these soils is often stunted.

Land type Ae 18 consists of the Shortlands soil form. These red sandy clay soils have a clay content of between 33 and 55 percent. These soils are very stable against erosion, stabilized by the high iron content. The soil is nutrient rich and supports sweetveld with high carrying capacity under good rainfall (Macvicar 1991).

In the semi-arid regions there is usually a strong correlation between underlying geology, soil types and vegetation (Van Rooyen, Grunow & Theron 1990). The soil has a major influence on the plant species composition as well as the vegetation structure (Schmidt 1992).

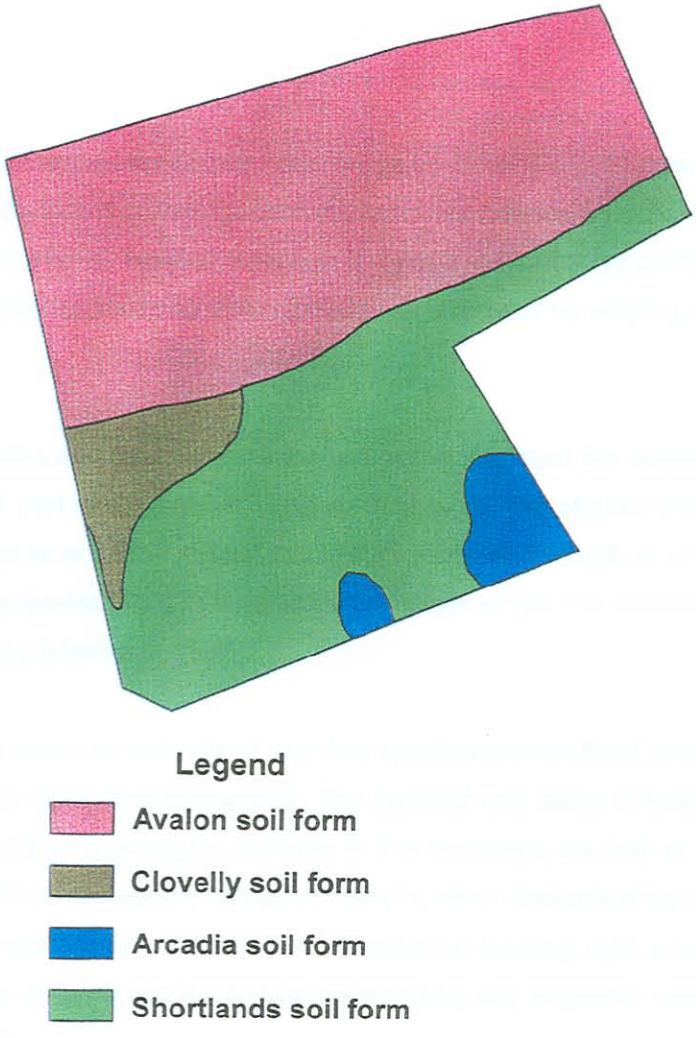


Figure 7: Soil types found on Sondela Nature Reserve