CHAPTER 2

THE ENVIRONMENT AND STUDY AREA

A number of papers have been published on the Nylsvley Ecosystem, Hirst (1975), Lubke, Clinning and Smith (1975) van der Meulen, Zwanzinger, Gonsalves and Weisser (1976), Huntley (1977, 1978), Harmse (1977) and Jacobsen (1977). These authors report on various aspects of the ecology of the area and provide descriptions of the climate, soil, vegetation and fauna. However to elucidate the position of the present study within the context of the Ecosystem Project, the various aspects are discussed in more detail.

The physical and botanical characteristics

The savannas of Nylsvley (24°29' S; 28°42' E), lie in the Mixed Bushveld, Acocks (1953), of the central Transvaal, approximately 10 km south of the town of Naboomspruit (Figure 2). The elevation of the area varies between 1 080 m and 1 140 m a.s.l. and there is a small, seasonal river (the Nyl river), flowing across the reserve from SW to NE along a strip of marshy lowland. On account of the very low drainage elevation from one end of the Reserve to the other (7 m), extensive flooding results during the rainy season. Prominent hills are Maroelakop (1 140 m) in the south and Stemmerskop (1 090 m) further to the north west. The southern elevations are mainly underlain by sandstone and conglomerate bands of the Waterberg system, while the northern elevations are underlain by felsites of the Bushveld Igneous Complex. Several soil series occur associated with differences in geology and topography. The higher lying areas have relatively sandy soils and carry mostly a broad-leaved deciduous savanna as opposed to the lowlands, where the soil is largely calcareous clay with microphyllous deciduous thorn savanna. Both areas exhibit a marked seasonality with regard to the grass layer.

Termitaria are a feature of the northern elevation of the felsites, as well as along the edge of the Nyl floodplain. The area experiences a moderately low summer rainfall with a dry frosty winter period.

In the past, the area was used mainly for cattle ranching and was conserved as far as possible. Small areas of lowlands have been ploughed, while disturbed areas of abandoned bantu settlements are still present on the

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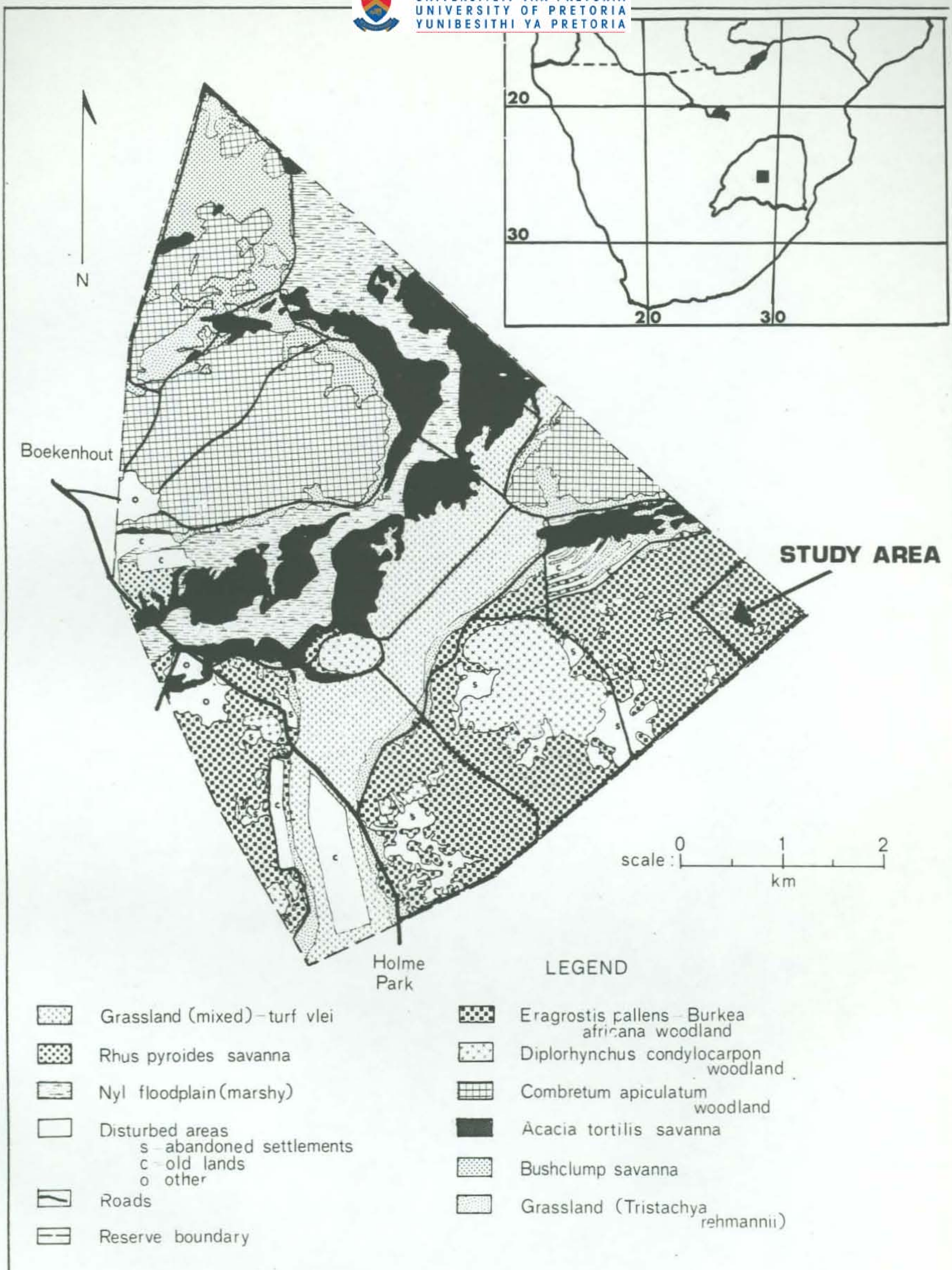

Fig. 2 . VEGETATION OF NYLSVLEY NATURE RESERVE.
(modified from Coetzee et al (1977))
Showing the vegetation types and the locality of the study area.

sandstone elevations of the south, forming patches of microphyllous vegetation within the broad-leaved deciduous savanna. The use of the area as a cattle ranch has permitted a wide variety of vertebrate species to maintain viable populations, Jacobsen (1977).

The soils

The soils on Nylsvley may be grouped into five broad categories, Harmse (1977):-

(a) litholitic soils;
(b) non-calcareous, well-drained sandy soils;
(c) non-calcareous, poorly-drained sandy soils;
(d) calcareous, alluvial soils;
(e) calcareous, vertic black clay soils.

Of these, only the first two are present in the study area, and the first only in the isolated rocky outcrops found in the upper elevated areas. They are characterised by unconsolidated material or hard rock with a minimum of soil particles.

The majority of the area is covered by non-calcareous, well-drained sandy soils, including in this category on the more elevated areas, well-drained sandstone mainly of the Hutton and Mispah forms with isolated rocky outcrops. The sandy soil is medium to coarse with red B-horizons. Lower down the slope the Clovelly form also originating from the Waterberg sandstone predominates. This soil is also sandy but has a yellow B-horizon. It tends to be more water-logged than the soil higher up the slope. However, several series are distinguished and together form a topo-sequence. This sequence from upper to lower slopes consists of dystrophic, mesotrophic and eutrophic Hutton soils, followed by dystrophic and mesotrophic Clovelly soils. The well-drained soils of the elevated areas of the study site provide a habitat for many animals which are not found elsewhere. This is also no doubt due to the small amount of clayey material found in the B-horizon, while the sand is considerably coarser, promoting faster drainage, as well as allowing easier access for burrowing reptiles and amphibians, particularly during the winter months. The area is also favourable to the incubation of the eggs of reptiles which are subject to fungal attacks if too much moisture persists. Moreover, this is the only habitat of the Hottentot golden mole (Amblyosomus hottentotus), which probably feeds mainly on burrowing lizards (Lygosoma sundevallii) and amphisbaenians (Monopeltis capensis), which are also restricted to this habitat.

The vegetation

As mentioned previously, the vegetation of the study area consists of broad-leaved deciduous savanna with smaller areas of microphyllous savanna established on areas of disturbed soil, such as old kraal sites. The communities of the elevated sandstone regions grow in shallow to deep non-calcareous soils which may be litholitic. Frosts are relatively mild and the soils well-drained.

On the elevated slopes, a tree savanna is more apparent, with a gradual change in structure to a grass savanna lower down the slopes with impeded drainage. The upper slopes of the study area therefore are covered by the Eragrostis pallens -Burkea africana tree savanna, Coetzee et al. (1976). This community occurs on the non-litholitic, sandy soils. These soils have a low nutrient status and consequently the ground cover is relatively open with Eragrostis pallens, the dominant grass. The topography is flat to very gently sloping, usually less than 2^{o}. Occasionally, sandstone outcrops occur. There is usually a 5-10% cover of plant litter, mainly leaves from Burkea africana and Ochna pulchra but twigs and grass also form a part. Dead trees are occasionally found lying on the ground and provide food and shelter for many invertebrates, as well as reptiles such as Lygosoma sundevallii, Lygodactylus capensis and Mabuya varia.

This community is differentiated by a number of tree and shrub species, including Grewia flavescens, Strychnos pungens, S.cocculoides, Lannea discolor and Securidaca longepedunculata. In the field layer, the grasses Eragrostis pallens, Aristida congesta and A. stipitata predominate, while herbs such as Vernonia poskeana, Limeum viscosum, Cleome rubella and Dichapetalum cymosum are characteristic. While this community is broadly defined, it actually consists of three variations, Coetzee et al. (1976).

(a) Eragrostis pallens - Dombeya rotundifolia variation found mainly on the middle and upper slopes of the study area and making up two-thirds of the reptile and amphibian study area. This variation is found on the Hutton and Mispah soil forms. Total tree cover varies from 20 to 60% and the trees range in height from seedlings to 15 m with Burkea africana, Terminalia sericea and Combretum molle dominant, while Grewia flavescens and Ochna pulchra are the main shrubs. The grass and forb cover varies from 15 to 65%. Structurally, this variation can also be differentiated from the other two variations because some woody species are taller here than elsewhere. Such species include Strychnos pungens, Lannea discolor, Ochna pulchra and Terminalia sericea. In the other two variations these species occur as coppicing shrubs with emergent dead twigs, possibly caused by cold air accumulation or impeded drainage.

This area is characterized by the faunistic component of which Amblyosomus hottentotus, Xenocalamus bicolor australis, Monopeltis capensis and Psammobates oculifer are endemic while others such as Lygodactylus capensis, Ichnotropis capensis, Thelotornis capensis and Lygosoma sundevallii are most common.

Most dead wood occurs in this variation and the area is characterized by large accumulations of leaf litter around the bases of Ochna pulchra and Grewia flavescens clumps,providing good foraging areas for lizards such as Panaspis wahlbergi and Ichnotropis capensis. The preponderance of Grewia flavescens shrubs and Strychnos pungens trees are of importance to the vine snake (Thelotornis capensis) population, as will be discussed later.

In winter, the area tends to have large areas bare of vegetation and by August most trees have shed their leaves. Only Strychnos pungens and Euclea crispa appear to be evergreen. The leaf litter and grass among and at the base of shrubs therefore are important in providing cover for insects and termites, which are the main food item of many species of reptiles and amphibians.

(b) Eragrostis pallens - Setaria perennis variation

This is the variation found on the lower third of the study area and is mainly in association with the dystropic Clovelly soils (Mosdale series). It differs from (a) above in that it is characterized by Faurea saligna trees which may be up to 10 m tall. The dominants in the tree and shrub layers are Burkea africana, Terminalia sericea and Ochna pulchra, while in the field layer Eragrostis pallens occupies the higher lying areas and Setaria perennis the lower slopes. The mean number of trees per unit area is half of variation (a) and total tree cover is less than 50%. The shrub cover is less than 10% but the field layer of up to 1,8 m high covers 30-75%. This is mainly due to the presence of Setaria perennis and Elionurus muticus. The soil appears less well-drained than that of (a) and therefore permits a more vigorous field layer.

The faunistic component of these lower slopes is consequently more depauperate but some species occur here but not, or only very rarely in (a). Such species include Ichnotropis squamulosa, Cryptomys hottentottus, Bitis arietans, Otomys angoniensis and Rhabdomys pumilio. The vine snake (Thelotornis capensis) only visits here irregularly during the summer months, but the Egyptian cobra (Naja haje annulifera) is most common. This is probably connected with the greater abundance of small mammals here than in (a).

(c) Eragrotis pallens - Trachypogon spicatus variation

This vegetation, found on the coarse mesotrophic Clovelly soils is found to the west of Maroelakop and therefore not in the reptile study area. It is characterized by a similar presence of trees as in the previous variation. Terminalia sericea has generally a higher cover at heights of over 4 m than Burkea africana. Total tree cover can reach 20%. Common woody species include Terminalia sericea and Burkea pulchra, while Ochna pulchra, Burkea africana, Terminalia sericea and Combretum molle dominate the lower tree layer. The main shrub species include Ochna pulchra, Burkea africana and Terminalia sericea. The field layer is dominated by Trachypogon spicatus and Eragrostis pallens with a height of 1,75 m and a total cover of 30-50%.

The faunistic component resembles that of the previous variation although there is a general paucity of species in this vegetation type.

Amongst the woody savanna typified by Burkea africana are small rocky outcrops of Waterberg sandstone. These, in particular the larger ones, have a vegetation characteristic of the large sandstone elevations such as Maroelakop and Stemmerskop. The soils are litholitic and rocks cover 10-60% of the area. Common differential species include Diplorhynchus condylocarpon and the shrubs Barleria bremekampii and Landolphia capensis, while a variety of forbs such as Tephrosia longipes, Rhynchosia totta, Corchorus kirkii and Indigofera comosa are also characteristic. Other trees common to these areas include Pseudolachnostylis maprouneifolia, Canthium gilfillanii and Croton gratissimus.

Schizachyrium jeffreysii is a common grass growing in the pockets of soil collected in the hollows while Enneapogon scoparius grows in areas of shallow soil. The cracks, fissures and loose rock enable some of the rock dwelling reptiles to thrive there. Such species as Pachydactylus bibronii and Naja mossambica are characteristic and even the veld monitor, Varanus exanthematicus albigularis may reside there.

Finally, we have the communities found on disturbed areas of abandoned settlements. These were sites of old bantu settlements and the soil is eutropic and of the Hutton series, with a high phosphate content. Tall Sclerocarya caffra trees, occasionally dotted around the settlements are characteristic, while thorn trees, Acacia tortilis and to some extent A nilotica predominate. The grass layer is formed mainly by Eragrostis lehmanniana which may form up to 80% cover. Solanum delagoense and Crotalaria pisicarpa are forbs characteristic of the area. There is a notable absence of rotting woody material lying on the ground and therefore little cover for reptiles which are not burrowers as well as arboreal species, although the boomslang, Dispholidus typus, may occur. This area is noteworthy for the virtual absence of the Cape dwarf gecko, Lygodactylus capensis, which is abundant in the surrounding Burkea africana - Eragrostis pallens savanna. The main reason for this is the paucity of loose bark and holes in which it can seek shelter. The lack of dead wood is no doubt due to the relatively recent removal of these settlements and this vegetation is presumably transitional.

Fire

The study area has been subject to periodic fires prior to the start of the survey and evidence of this is still discernible on the tree trunks and other charred logs and stumps in the area. Fire has a considerable impact on the vegetation as well as on the fauna. This is easily seen in areas which are repeatedly burnt every second year as fire breaks. Such areas have scanty vegetation cover which, in particular on the higher slopes, does not regrow fast enough to be able to burn after one season's growth. Similarly, although at this stage not quantitatively assessed, the reptiles are also affected by the paucity of cover. Fire, in addition, kills off numbers of animals, in particular geckos, as they are usually found inhabiting logs lying on the ground and which burn very easily. Other animals shelter under piles of vegetation and are also incinerated. Several tortoises examined on Nylsvley bore signs of having been in a veld fire.

Barbault (1971, 1973, 1974a) mentions that the animals do not flee over great distances during a veld fire but instead move into areas not burnt or into holes and other hideouts. He shows that there is a drastic decline in the number of reptiles per hectare. For instance, the density of snakes dropped from 3,0/ha just prior to the fire, to 0,7/ha afterwards.

In a comparison between burnt and unburnt savanna, Barbault (loc.cit.) showed that the density of snakes and lizards was twice as great in unburnt savanna, than that of these animals in savanna which was regularly burnt. Some changes in species composition were also apparent and were directly related to an increase in cover in the unburnt savanna.

Fires in the savanna usually occur during the winter months when the animals are hiding up in thick vegetation or in holes and in rotting logs. They hibernate at this time and are therefore very sluggish and unable to make an escape.

Barbault (loc. cit.) showed that a rapid recovery rate is possible, but whether this is also the case at Nylsvley, is not known, and considered unlikely owing to the pronounced seasonality of the climate and, therefore, the reptile populations. Lamto experiences a tropical climate where animals are active throughout the year. Both temperature and moisture are considerably more favourable.

Historical background and land use

As mentioned previously, the reserve was utilised for beef production from 1945 until the purchase of the property and its proclamation as a Nature Reserve in 1974. This started off with approximately 700 head of cattle, but was subsequently reduced to about 500 head, representing a stocking rate of one large stock unit/six hectares. The farm (3 120 ha), was divided into 25 paddocks, of which the main ones ranged in size from 200-250 ha. Water was available from the Nyl river and two boreholes, while seasonally inundated pools, scattered in other low-lying areas, contributed to the supply. Rotational grazing was practiced and the whole farm was grazed as

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determined by water availability and rainfall. Overgrazing was avoided and the vegetation was periodically rested. The Ecosystem study area of 750 ha was grazed from mid-January to mid-May. The area was divided into four paddocks, which were grazed by two herds of cattle of approximately 150 head each. The poisonous plant, Dichapetalum cymosum, prevented the use of these paddocks at other times of the year. This system was continued during the present study period, i.e. from May 1975 to May 1977 after which the cattle were removed.

Various other animal species inhabited the study area, among them 11 amphibian, 41 reptile and 43 mammal, Jacobsen (1977). The latter include kudu (Strepsiceros strepsiceros), impala (Aepyceros melampus), reedbuck (Redunca arundinum), warthog (Phacochoerus aethiopicus), duiker (Sylvicapra grimmia) and steenbok (Raphicerus campestris), among the larger animals; while monkeys (Cercopithecus pygerethrus), porcupines (Hystrix africae-australis) and springhares (Pedetes capensis) also occur. Of importance to the reptiles and amphibians are the small carnivores, such as mongooses, genets and black-backed jackal (Canis mesomelas), which are predators of lower vertebrates. Slender (Herpestes sanguineus), and banded (Mungos mungo) mongooses are particularly active and can smell prey as far down as 20 cm in the soil. Raptors, such as the black-breasted snake eagle (Circaetus gallicus pectoralis), lizard buzzard (Kaupifalco monogrammicus) and martial eagle (Polemaëtus bellicosus), are important reptile predators, while numerous insectivorous birds are found, many of which feed on the smaller reptiles.

The climate

Temperature

During the course of the study, climatic data were routinely collected. Three sites were simultaneously monitored in the Ecosystem study area, named stations 1, 2 and 3. Station 1 was located in Paddock 1, which was my study area (Figure 3). The data recorded were as per Table 1. Unfortunately, during the initial stages of the project, considerable error was experienced in the weather recording at station 1. Also because soil temperatures as well as humidity were only measured at station 2, this station's data are also included.

The climate of the area is semi-arid with distinct seasons; a hot, wet season from October to April, followed by a cool, dry season from May to

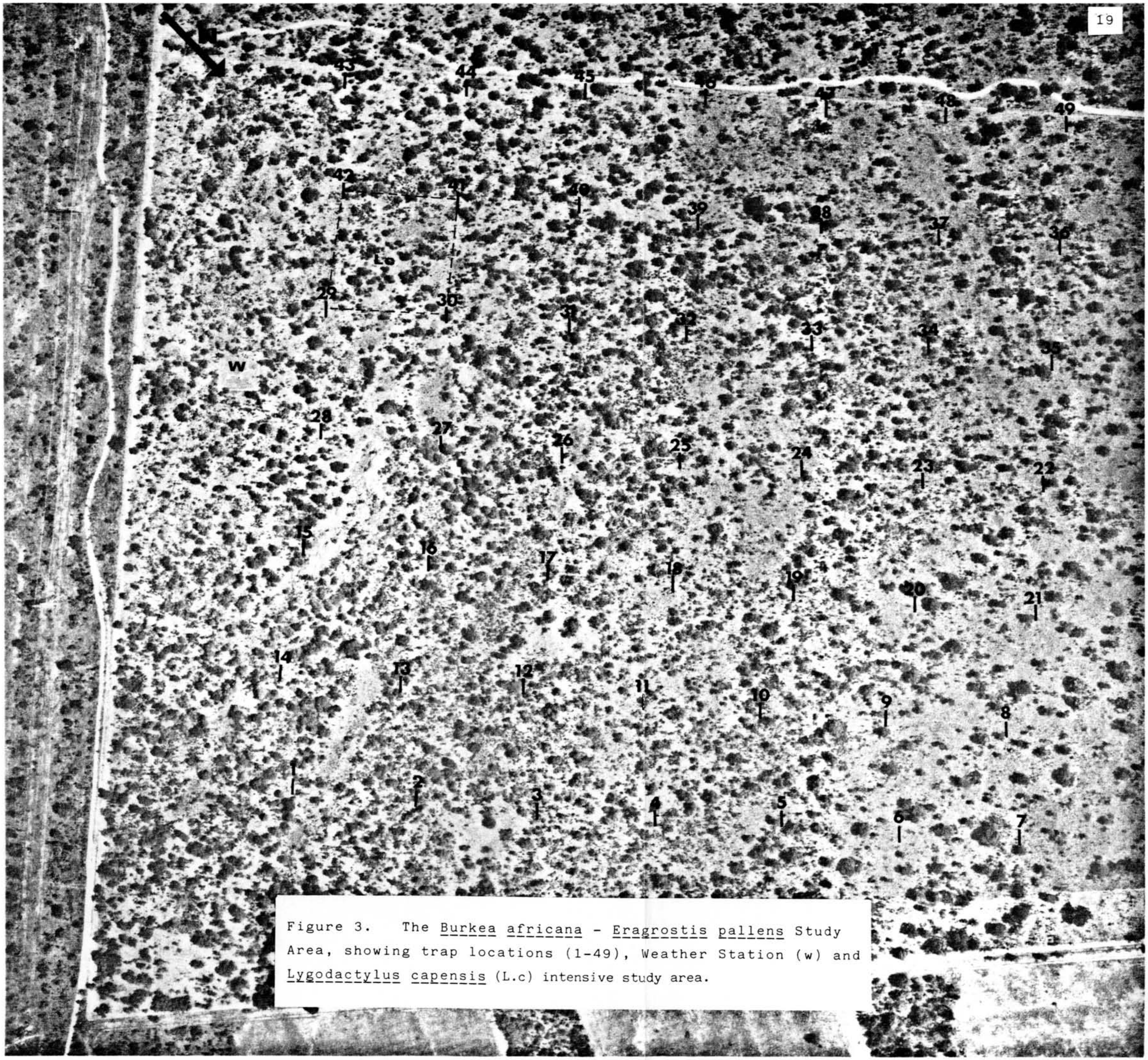

Figure 3. The Burkea africana - Eragrostis pallens Study Area, showing trap locations (1-49), Weather Station (w) and Lygodactylus capensis (L.c) intensive study area.

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Table 1. Climatic data measured at two stations, four kilometres apart, over the period May 1975 to December 1977, in the Ecosystem Study Area.

	1975		1976 (Station 1)											
	Dec.	Nov.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean temperature	20,6	22,3	21,9	18,2	20,9	18,6	13,4	12,7	12,8	14.6	19.4	20,2	20,9	23,1
Mean max. temperature	27,4	29,6	27,7	24,1	26,5	24,6	21,9	21,2	22,0	23,7	27,8	28,4	27,8	30,5
Mean min. temperature	15,4	15,0	16,1	14,2	15,4	12,6	6,3	4,2	3,6	5,6	11,0	12,0	14,1	15,7
Mean rainfall	6,2	1,9	5,0	6,3	4,9	1,2	0,4	0	0	0	0,3	4,3	4,2	1,9
Total rainfall	191,0	56,7	159,9	181,5	151,4	37,0	13,0	0	0	0	9,9	134,8	127,2	58,0
Maximum raindall	62,9	15,2	84,0	62,9	62,9	28,0	5,5	0	0	0	7,9	62,9	35,1	13,4
Minimum rainfall	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daily mean relative humidity	0	0	0	0	0	47,2	72,8	58,7	48,5	47,8	41,1	47,0	55,3	53,6
Daily mean max. humidity	0	0	0	0	0	98,0	98,0	98,4	99,4	98,5	85,5	89,5	98,0	86,5
Daily mean min. humidity	0	0	0	0	0	65,0	36,0	37,0	21,5	23,0	17,0	24,5	18,0	28,5
0800 Mean humidity	0	0	0	0	0	49,8	82,8	72,1	61,7	64,8	56,3	60,5	62,7	63,7
14,00 Mean humidity	0	0	0	0	0	44,6	62,9	45,3	35,3	30,8	25,9	33,4	48,0	43,5
No. of rain days	19	11	9	11	9	3	4	0	0	0	2	8	11	9

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	1977 (Station 1)											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean tempterature	24,3	21,7	19,8	19,7	15,9	14,0	13,2	16,0	19,4			
Max. mean temperature	31,8	28,4	25,2	27,0	24,6	22,9	22,0	24,4	26,8			
Min. mean temperature	17,1	16,1	14,5	12,4	7,2	5,1	4,4	7,5	(10,7) (13,1)			
Min. mean temperature	17,1	16,1	14,5	12,4	7,2	5,1	4,4	7,5	12,0			
Mean Rainfall (mm)	2,9	3,2	5,9	0,1	0,1	0	0	0,7m	1,0			
Total rainfall (mm)	89,2	90,1	183,6	5,9	4,6	0,2	0	20,6	29,4			
Max. rainfall (mm)	30,1	31,2	51,7	2,8	4,2	0,2	0	19,3	11,1			
Min. rainfall (mm)	0	0	0	0	0,4	0	0	1,3	1,6			
Daily mean relative humidity	53,7	63,4	67,9	59,5	45,9	44,6	46,5	43,6	53,8			
Daily mean max. humidity	86,5	82,0	98,9	92,0	67,0	68,0	61,0	70,5	96,0			
Daily mean min. humidity	26,5	46,0	39,0	37,0	26,5	25,5	30,5	24,5	21,5			
0800 Mean humidity	64,5	76,4	79,6	75,8	63,4	63,3	64,9	58,6	69,2			
1400 Mean humidity	43,0	50,3	56,2	43,2	28,5	25,9	28,1	28,5	38.3			
No. of rain days	11	8	11	3	2	1	0	2	6			

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Table 1 continued

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Weather Data - Nylsvley

Station 2

May 1975 - December 1977

Month	Soil temperature 10 cm			20 cm			30 cm			60 cm			MMT	MMT	Mean	R mm	RD	M. RH.	0800	1400	Wind km/day	Sunshine Act. h/d	Poss.
1975	0800	1400	A	0800	1400	A	0800	1400	A														
May	13,8	24,7	19,3	15,7	20,4	18,1	16,2	21,8	19,0	20,2	19,9	20,0	24,1	8,3	16,2	5,7	5	8,4	9,0	7,8	0	0	10,8
June	10,4	20,8	15,6	12,6	16,7	14,7	13,0	18,1	15,6	17,5	17,2	17,4	20,6	4,5	12,6	10,6	3	9,2	6,6	11,8	0	0	10,5
July	10,2	20,3	15,3	12,7	16,1	14,4	12,3	18,0	15,4	16,9	16,9	16,9	21,0	3,1	12,0	0	0	5,4	6,1	4,7	0	0	10,6
Aug.	12,8	23,2	18,0	15,5	19,1	17,3	15,7	20,8	18,2	18,6	18,5	18,6	23,7	6,4	15,1	4,5	1	4,4	5,8	3,1	0	0	11,1
Sept.	18,8	30,7	29,6	20,9	24,1	22,4	20,9	26,4	23,6	22,6	22,4	22,4	27,8	11,7	19,8	0,2	1	4,4	6,0	2,8	0	0	11,8
Oct.	20,7	33,0	26,7	22,3	27,0	24,5	22,3	28,2	25,1	24,3	24,1	24,2	28,9	13,0	21,0	22,3	5	5,4	5,0	5,6	0	0	12,6
Nov.	22,0	33,9	28,0	24,6	33,4	29,0	22,7	29,6	26,2	25,0	24,8	24,9	29,4	15,5	22,4	57,7	13	49,9	62,4	37,4	0	0	13,2
Dec	21,5	33,3	27,5	0	0	0	22,1	28,4	25,3	24,1	24,2	24,2	27,6	16,0	21,7	203,4	18	62,8	75,3	50,2	0	0	13,5
1976																							
Jan.	22,5	33,3	27,9	0	0	0	23,2	28,2	25,7	25,1	25,1	25,1	27,9	16,5	22,2	102,6	11	62,5	71,1	53,8	0	0	13,3
Feb.	20,9	30,8	25,8	0	0	0	22,4	27,6	25,0	24,5	24,3	24,5	27,8	16,3	22,1	149,7	9	68,3	81,6	53,5	0	0	12,8
Mar.	20,0	28,9	24,4	0	0	0	21,5	26,4	23,9	23,9	23,9	23,9	26,4	15,4	20,9	81,9	8	70,5	85,0	56,1	0	0	12,1
Apr.	17,5	26,9	22,2	19,5	23,5	21,5	19,3	24,1	21,7	22,1	21,9	22,0	29,6	11,5	18,0	34,1	4	65,9	85,6	46,2	0	0	11,4
May.	12,2	21,8	17,0	19,9	18,4	16,7	14,7	19,6	17,2	19,1	18,6	18,9	21,6	6,8	14,2	15,1	4	65,8	85,4	46,0	0	0	10,8
June	10,2	17,4	14,8	13,0	15,8	14,4	12,5	17,5	15,0	16,6	16,6	16,6	20,9	4,4	12,7	0	0	58,0	81,2	34,8	0	0	10,5
July	9,2	18,9	14,1	12,9	15,7	14,3	12,2	17,5	14,9	16,2	16,2	16,2	21,8	3,9	12,8	0	0	49,7	69,7	29,6	0	0	10,6
Aug.	12,3	22,6	17,6	14,8	18,6	16,7	14,0	20,0	17,0	17,4	17,5	17,4	23,6	5,9	14,7	0	0	46,0	64,1	27,8	143,8	0	11,1

Table 1 continued.

Station 2 (continued)

Month	Soil temperature 10 cm			20 cm			30 cm			60 cm			MMT	MMT	Mean	R mm	RD	RH.	0800	1400	Wind km/day	Sunshine Act. h/d	Poss.
1976	0800	1400	A	0800	1400	A	0300	1400	A	0800	1400	A											
Sept.	18,2	27,1	22,6	19,5	23,7	21,6	19,6	25,2	22,5	21,5	21,5	21,5	27,4	11,4	19,4	8,9	2	43,7	57,0	30,4	156,0	0	11,8
Oct.	20,3	30,0	25,1	21,7	29,4	25,6	22,2	26,4	24,3	24,3	24,2	24,2	27,3	16,5	21,9	35,0	7	50,3	65,1	35,6	161,9	0	12,6
Nov.	22,5	29,6	26,0	21,6	26,9	24,2	21,5	26,6	24,0	23,4	23,3	23,4	28,3	14,5	21,4	142,6	11	58,9	68,2	49,6	227.0	10.0	13.4
Dec.	25,6	32,2	28,9	24,2	29,7	27,0	24,2	27,4	26,9	26,2	26,0	26,1	29,7	15,5	22,6	71,6	9	59,4	79,0	48,8	136,5	0	13,5
1977																							
Jan.	0	0	0	26,0	30,8	28,4	25,9	31,1	28,5	27,3	27,1	27,2	31,5	16,8	24,2	73,0	10	56,0	67,3	44,7	127,9	0	13,3
Feb.	22,7	34,6	28,9	24,3	29,5	26,9	24,2	29,0	26,6	26,2	26,1	26,2	28,9	16,3	22,6	105,2	8	63,5	76,6	50,4	118,3	7,3	12,8
Mar.	19,5	28,2	23,9	21,5	25,1	23,2	21,4	25,1	23,2	23,9	23,5	23,7	25,2	15,2	20,2	178,7	12	73,5	85,6	61,4	107,9	5,8	12,1
April	18,6	27,7	23,2	21,4	24,2	22,8	20,9	25,7	23,3	23,3	23,2	23,3	26,2	12,8	19,5	1,2	2	62,5	79,8	45,2	2776,0	8.3	11.4
May	12,8	22,7	17,8	17,1	19,5	18,3	16,0	21,9	19,0	20,3	20,2	20,2	24,2	7,2	15,7	3,1	2	47,4	65,9	29,0	3542,0	9,6	10,8
June	9,6	19,6	14,6	14,3	16,2	15,2	13,1	19,1	16,1	17,5	17,5	17,5	22,5	4,9	13,7	0,3	1	45,7	65,2	26,2	3135,0	9,7	10,5
July	8,2	20,5	14,3	13,3	15,5	14,4	12,3	18,7	15,5	16,5	16,5	16,5	21,7	3,9	12,8	0	0	47,4	67,0	28,0	3283,0	10,2	10,6
Aug.	11,3	24,6	17,9	15,9	18,7	17,3	15,0	21,0	18,0	18,1	18,1	18,1	24,0	7,9	16,0	25,3	2	41,8	60,4	27,6	4263,0	9,3	11,1
Sept.	16,2	28,3	22,3	19,3	22,5	20,9	19,0	24,0	21,5	21,2	21,1	21,1	25,9	12,0	18,9	49,7	6	58,2	70,8	44,9	4489,0	8,2	11,8
Oct.	20,2	35,5	27,8	22,1	28,1	25,1	22,4	28,3	25,4	24,2	23,9	24,1	30,2	14,2	22,2	52,2	7	48,3	60,3	36,3	4690,0	10,1	12,6
Nov.	22,5	38,2	30,4	24,6	30,3	27,4	24,8	29,3	27,1	26,0	26,0	26,0	28,2	15,4	21,8	24,6	7	51,8	63,3	40,4	4561,0	8,5	13,2
Dec.	22,6	35,8	29,2	24,5	28,8	26,7	25,0	26,9	26,0	25,8	25,7	25,8	29,6	16,8	23,2	122,0	10	58,2	68,6	47,9	4500,0	7,5	13,5

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September. The mean annual ... :st (1975), Mean annual temperature is 18,6°C. Figure 4 summarises the general climate of the Study Area in the form of climate diagrams for stations 1 and 2.

The summer months are characterized by hot days and warm nights, particularly during the period September to December, after which the increasing rainfall introduced a cooling effect. There are variations, depending on the frequency and occurrence of the rainfall (Figure 5). Maximum and minimum temperatures can be seen in Table 1. It may be pertinent here to point out the differences in climate between stations 1 and 2, although they are only about 2 km apart.

During winter, however, temperatures are moderate during the day and cold at night, while clear skies associated with this time of the year permit extensive radiation of heat into the atmosphere. This accounts for the large daily range in temperature, especially during the months of June, July and August, reaching as much as 17,5°C between the mean maximum and mean minimum. Daily ranges may even be greater as temperatures may drop to as low as -5°C at night and rise to 24°C during the day. Ground frosts are experienced nightly in the lower lying areas of the Reserve, but are rare in the Study Area.

Fluctuations in mean monthly temperature and rainfall are shown in Figure 5, including the mean monthly ranges in temperature. As can be seen, the greatest ranges occur during the winter months, and the smallest during the fluvial season. This effect is enhanced along drainage lines, as mentioned previously.

Soil temperatures do not fluctuate as much as ambient temperatures, as shown in Figure 6, with temperatures recorded at depths ranging between 10 and 60 cm. Greater fluctuations are apparent at 10 cm depth, but from 20 cm downwards, the range between mean maximum and mean minimum temperatures is not very great and in the order of 5°C, with the greatest differences occurring in summer and the least in winter. This is in direct opposition to that of the ambient temperatures. At 30 cm depth, a temperature difference of 10°C is recorded between winter and summer. This large difference is, no doubt, partly responsible for the hibernation of reptiles at Nylsvley, as the cooler soil will enhance the effect of a depressed ambient temperature, and reptiles will remain in a torpid state until the heat of the sun penetrates the soil during September. Rise in temperature, therefore, will assist in activating the reptiles even when 30 cm below the surface.

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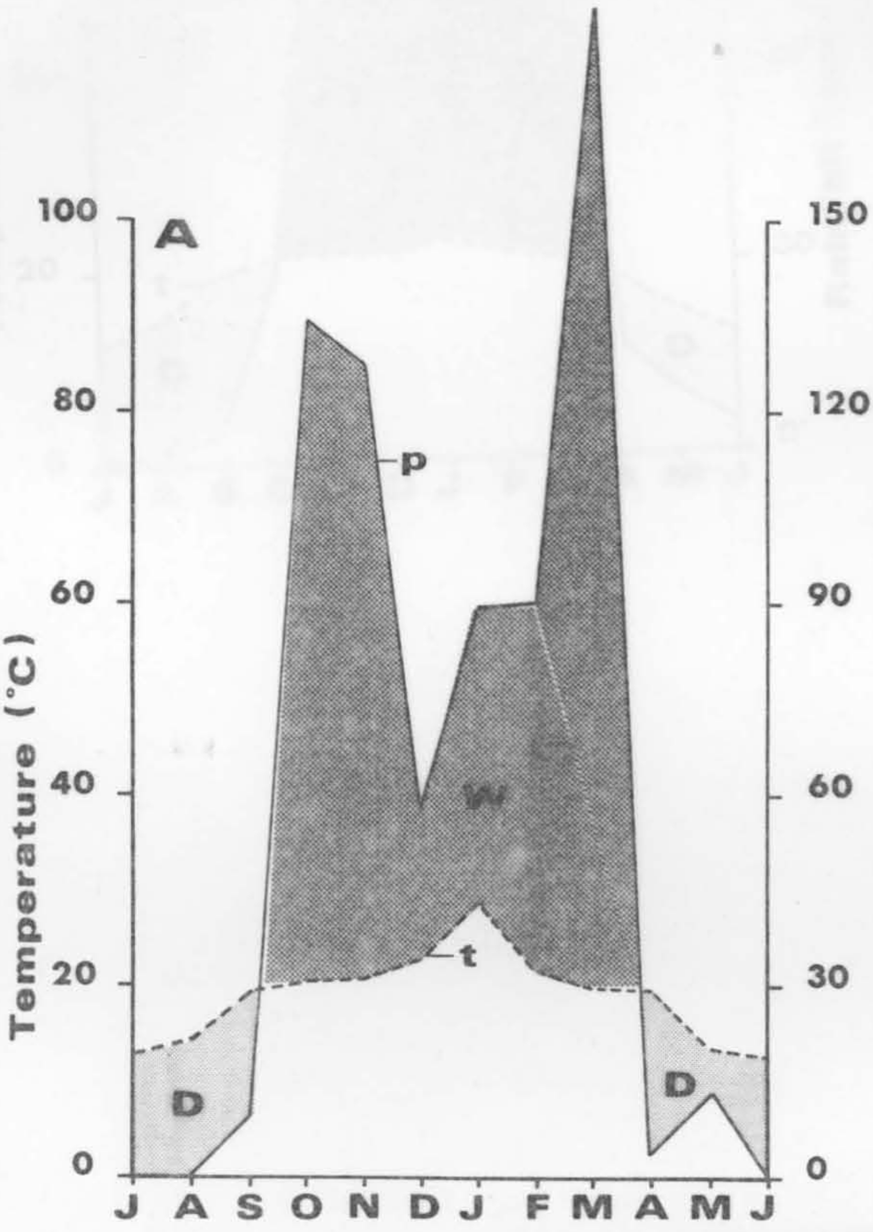

Figure 4. Climograph of two weather stations within the Ecosystem Study Area, showing the difference in climate over the period May 1976 to April 1977 (A) Station 1 and May 1975 - May 1977, (B) Station 2. p = mean monthly rainfall, t = mean monthly temperature, D = arid period, W = humid period.

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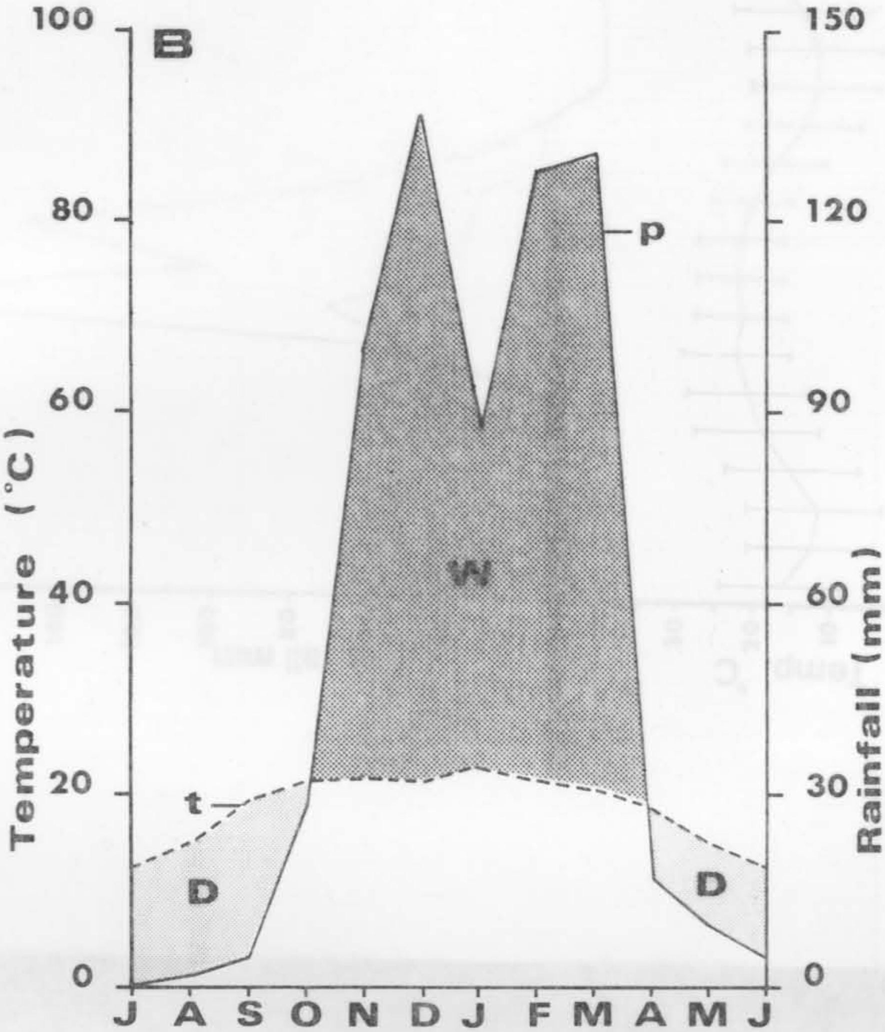

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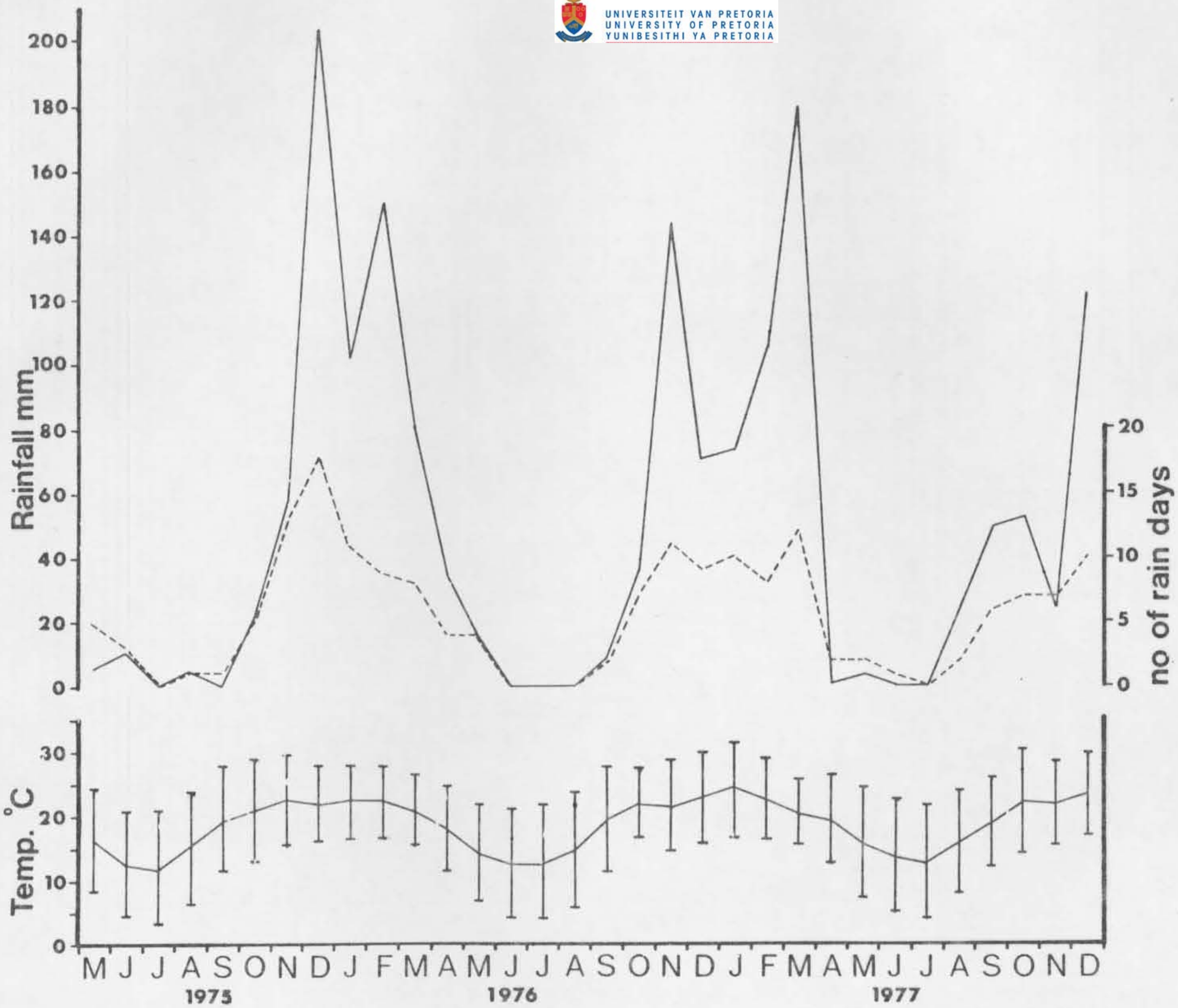

Figure 5. Mean monthly rainfall and temperature in the *Burkea africana* - *Eragrostis pallens* savanna, May 1975 - May 1977.

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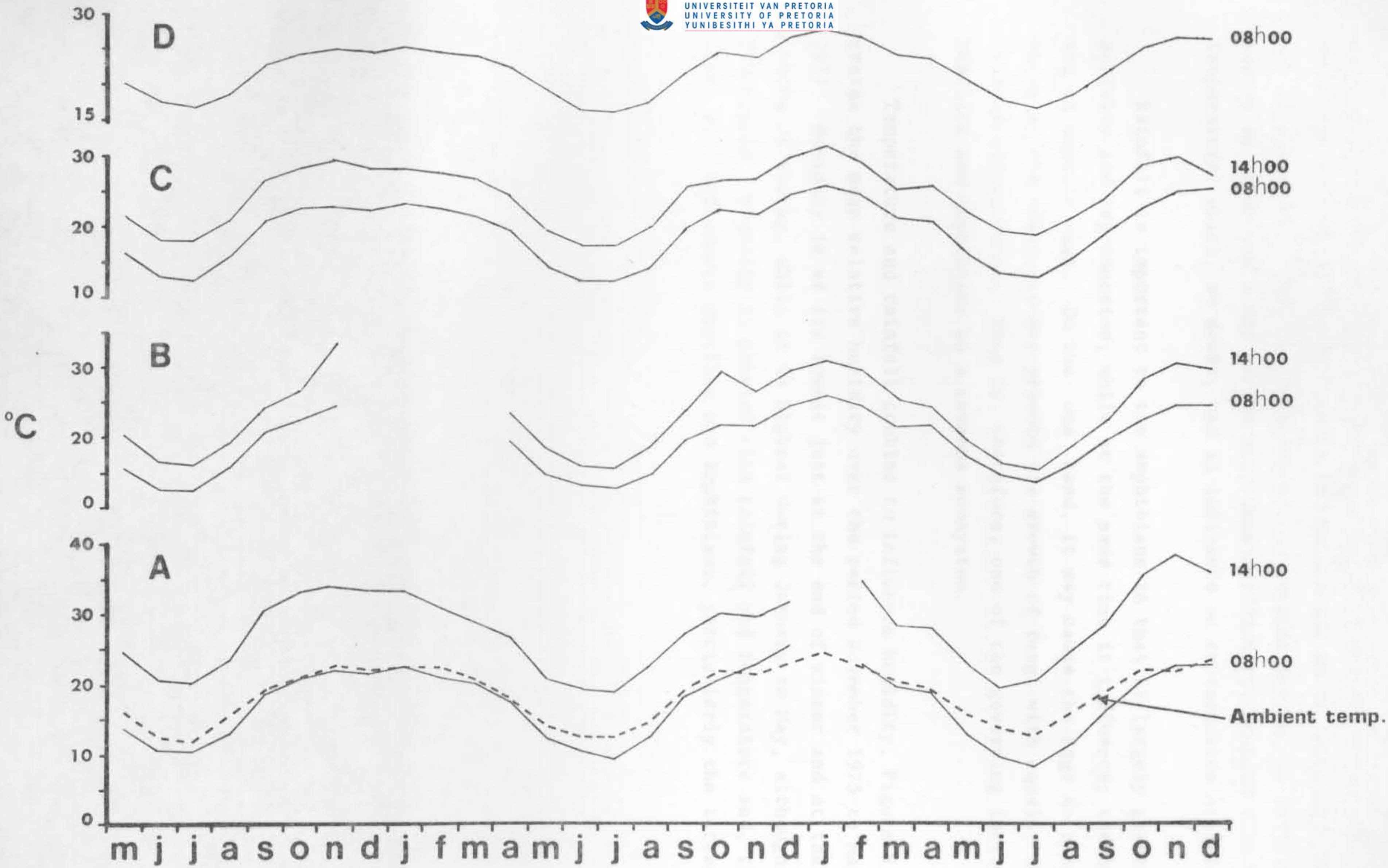

Figure 6. Mean soil temperatures in the Burkea africana - Eragrostis pallens Savanna: May 1975 - May 1977.

A = 10 cm B = 20 cm. C = 30 cm. D = 60 cm.

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Rainfall is variable and concentrated mainly between five and six months of the year. Rain falls most frequently in the form of diurnal thunderstorms of relatively short duration. Figure 5 shows the variation in mean monthly rainfall and the number of rainy days per month over the period May 1975 to December 1977. It can be seen that there are at least two to three months in which absolutely no rain falls. Note the difference in rainfall at stations 1 and 2 over the period November 1975 to May 1977, as seen in Figure 7. It can be seen that station 1 experienced, on average, more rainy days than did station 2.

Occasional hailstorms occur but do not appear to affect reptile or amphibian numbers, apart from a cooling effect similar to that of rainfall. Considerable fluctuations in rainfall occur from year to year and, although the mean of 630 mm, Hirst (loc. cit.), gives an indication, the two years 1975 and 1976 experienced 686 mm and 618 mm respectively, which came erratically. This was particularly pronounced during the 1976/77 season as there was a dry period over December/January, coupled with high temperatures which, no doubt, had an influence on reproductive activity.

Rainfall is important to the amphibians in that it largely governs activity and reproduction, while at the same time it influences the hatching of reptile eggs. On the one hand, it may cause the eggs to dehydrate, while on the other, it may promote the growth of fungi with equally disastrous consequences. This is, therefore, one of the governing factors of reptiles and amphibians in a savanna ecosystem.

Temperature and rainfall combine to influence humidity. Figure 8 illustrates the mean relative humidity over the period November 1975 to May 1977. Humidity is at its lowest just at the end of winter and at the beginning of spring, while it is highest during January to May, although it fluctuates. Humidity is coupled with rainfall and temperature and, therefore, also influences reptiles and amphibians, particularly the latter.

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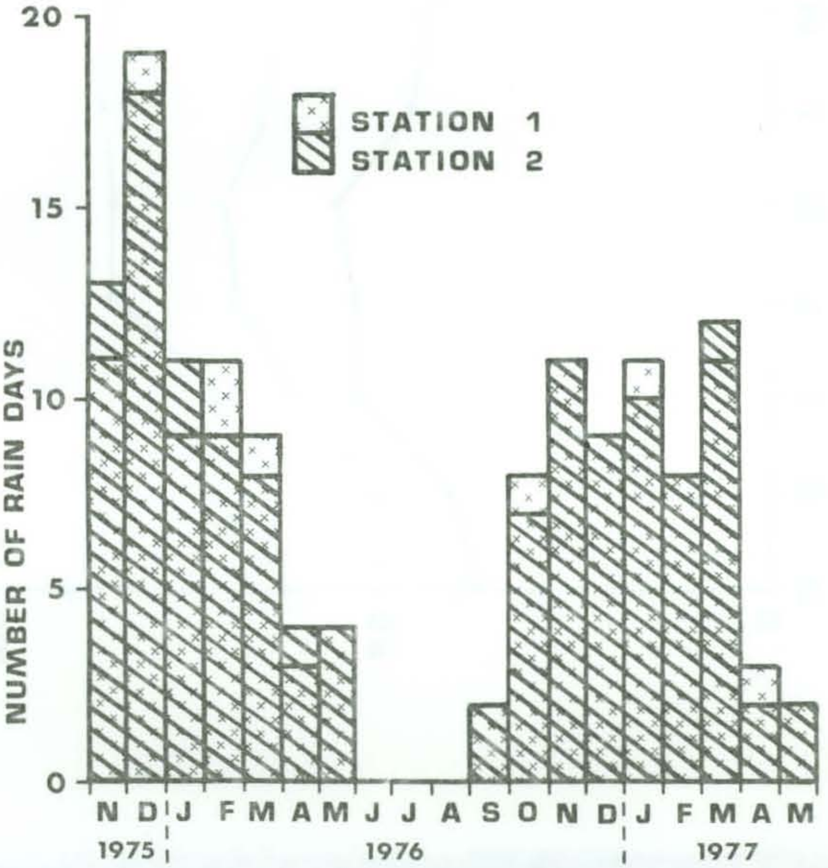

Figure 7. Occurrence of rain at Station 1 (November 1975-May 1977) and Station 2 (November 1975 - May 1977) in the *Burkea africana* Savanna

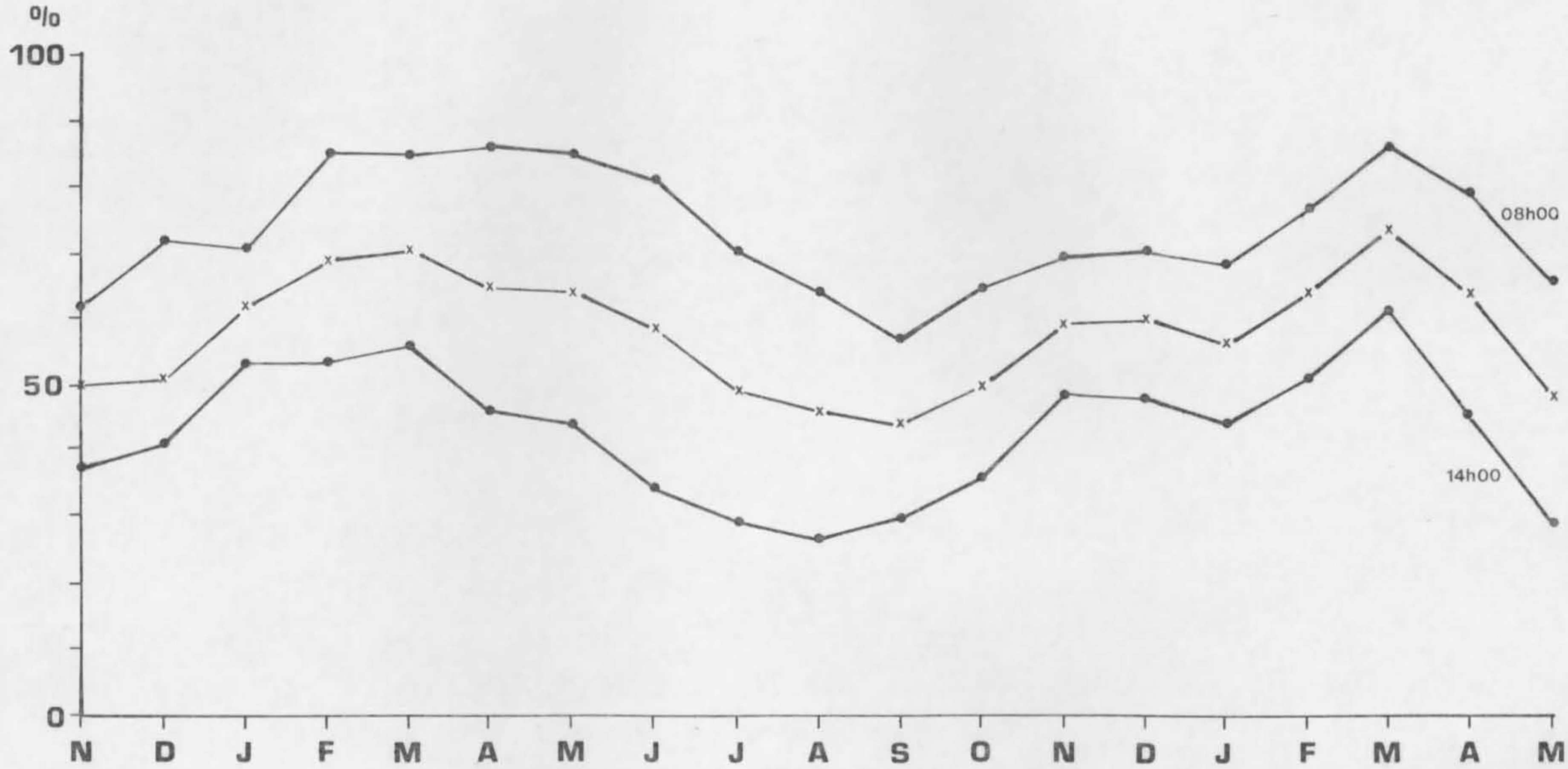

Figure 8. Mean relative humidity in the *Burkea africana* Savanna - November 1975 to May 1977.

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