CHAPTER 1
INTRODUCTION

An inventory is a statement listing the physical assets of a business or institution (Van Zyl, Von Bach and Bothma 1995) and the planning process for any business requires an analysis of the internal infrastructure and the available resources (Kroon 1996). For a game ranch the physical assets include infrastructure such as roads, pipelines, water sources, fences, vehicles, pumps and buildings. Further available resources include human resources, financial resources and the products being marketed, the natural resources in the form of geology, soils, wild animals and plants. The animals depend on their habitat for food, shelter and water and thus survival (Van Rooyen, Bredenkamp and Theron 1996). Therefore it follows that the habitat is an important resource that must be taken into consideration in the planning phases. Successful management of large natural areas thus depends a great deal on the composition of the vegetation, the extent to which it is being utilised, and the changes that take place in response to differential use by herbivores and fire (Walker 1976a). An inventory of the natural resources will deliver both qualitative and quantitative information on the geology, soils, vegetation and animals in an area. This then enables the wildlife manager to develop a multi-disciplinary and goal-orientated wildlife management plan.

Sango Ranch has committed itself to playing a constructive role in applying sound ecological principles in its land management practices, and to strive towards economic viability and social upliftment (Joubert 1999a). In this context, the objective of this study is to present an inventory of the natural ecosystems of Sango Ranch in order to develop a plan for the ecological management and utilisation of the natural resources of Sango Ranch in compliance with its vision, mission, aims and objectives. A general description of the physical environment, background and history of the Save Valley Conservancy and Sango Ranch is followed by an analysis and assessment of the soils as well as the plant and animal communities of Sango Ranch. This information is used in conjunction with published literature to make recommendations on the management of the vegetation and animal communities and on the sustainable utilisation of the various natural resources of Sango Ranch. It is recognised that the management guidelines presented here are speculative due to the complex nature of natural systems. Therefore they are only intended to be valid over a short period due to the dynamic properties of natural systems in southern Africa (Bothma 1995a). However, the management strategy recommended here utilises periodic data collection techniques in order to constantly update and improve management programmes and guidelines in accordance with new information or changes in aims and objectives.

CHAPTER 2
STUDY AREA

LOCATION

Sango Ranch is situated in the Save Valley Conservancy, Masvingo Province, in the southeastern Lowveld of Zimbabwe, 65 km northeast of the town of Chiredzi and 30 km north of Gona-re-zhou National Park (Figure 1). The Save Valley Conservancy consists of 23 individual properties and comprises an area of 345 067 ha (Figure 2). It stretches from southern latitudes 20° 00' and 21° 00' and eastern longitudes 31° 05' and 32° 25'. The Masvingo to Birchenough Bridge road and the Devure River marks the northern boundary of the Conservancy (Figure 1). The Save River forms the entire eastern boundary of the Conservancy (Figure 2). To the west lies the Devure Resettlement Scheme and the Matsai Communal Land, while the Mkwasine Sugar Estate marks the southern boundary. Sango Ranch lies in the centre of the Save Valley Conservancy north of the Turgwe River and consists of the properties Musawezi, Chanurwe and Sabi (Figure 2). Sango Ranch covers an area of 44 348 ha and lies between southern latitudes 20° 10' and 20° 23' and eastern longitudes 32° 00' and 32° 20'.

PHYSIOGRAPHY

The development of the landscape of the Save Valley Conservancy was caused by downward erosion within the Post-African erosion cycle (Lister 1987). The most prominent feature of the Save Valley Conservancy is the Save River that flows in a southerly direction in the conservancy. The Save River is the biggest river in Zimbabwe and the catchment area covers 84 550 km^2 (Natural Resources Bulletin 1998). The catchment area covers 4 200 000 ha in terms of resource base and forms the heart of the southeastern Zimbabwe Lowveld. According to the Natural Resources Bulletin (1998), the Save River is severely silted due to continuous degradation of the catchment area. Whitlow (1988), as quoted in the Natural Resources Bulletin (1998), estimated the extent of soil loss in the catchment to be 50 to 80 tons of soil per ha per year. Within the Save Valley Conservancy the Save River is at places 1.5 km wide (Broderick 1997).

The Save Valley Conservancy gradually slopes downward towards the southeast and is described as a flat plain with a few scattered koppies (Goodwin, Kent, Parker and Walpole 1997). The altitude of the Conservancy varies from around 400 m above sea-level in the south to around 800 m above sea-level in the northwest. Hills rise up to 250 m above the plains but are generally little more

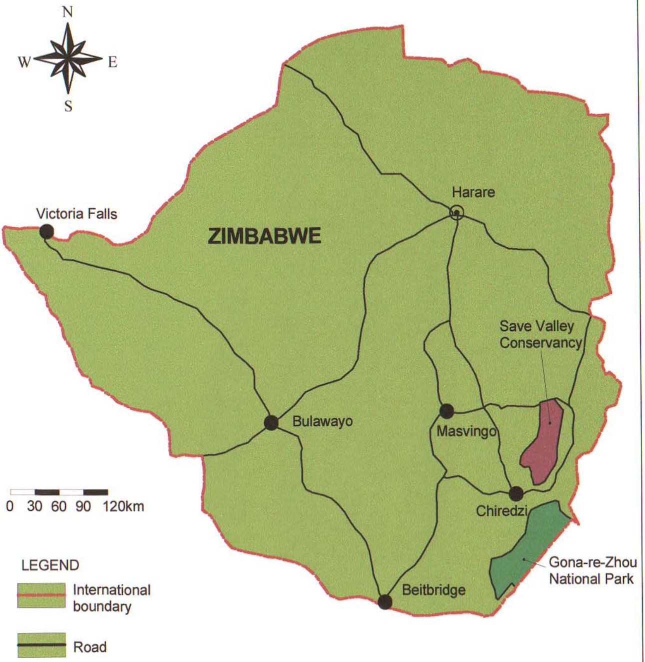
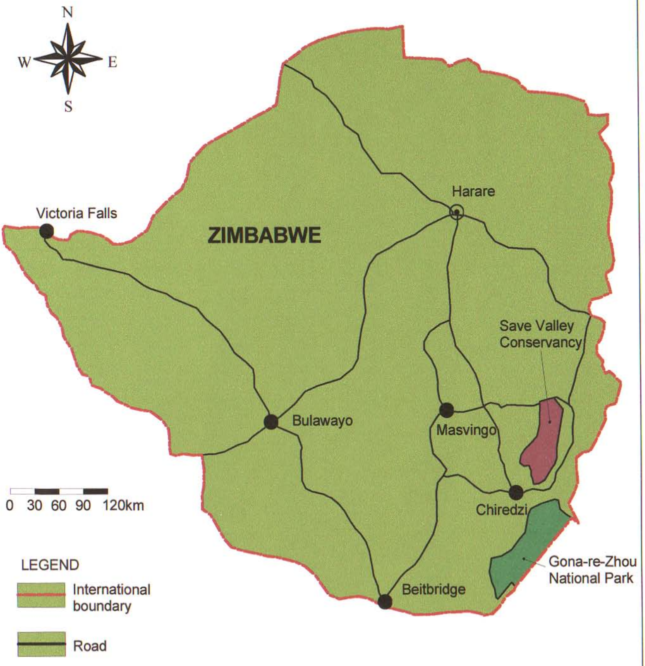


Figure 1: Location of the Save Valley Conservancy, Zimbabwe.



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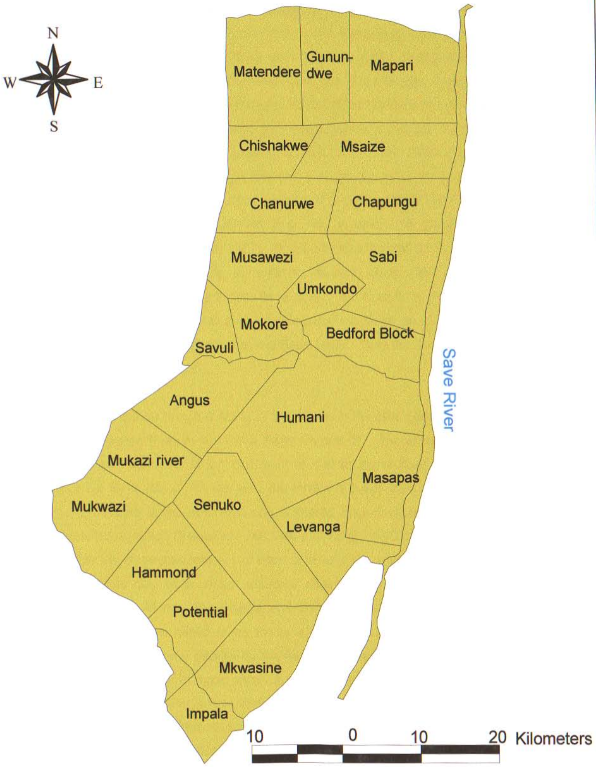


Figure 2: Map of Save Valley Conservancy, Zimbabwe, showing various properties.

than 100 m high. The Save Valley Conservancy is dissected by several seasonal rivers and streams, all flowing in a southeasterly direction, most notably the Msaizi, Makore, Turgwe and Mkwasine Rivers. An interesting feature is the extensive alluvium of the mid-Save River area, where deposits from the Save, Turgwe, Msaizi, Gunundwe Rivers and others have combined to form a plain 20 km wide, extending 60 km along the west bank of the Save River (Goodwin *et al.* 1997). It is speculated that this alluvium was deposited by a meandering Save River prior to its stabilisation in its present course (Swift 1962). The alluvium appears to be mostly derived from granite and has proven to be an excellent aquifer, with the Save River as a constant source of recharge (Swift 1962). The alluvium has been estimated to contain 215 775 ha-meters of groundwater (Hindson and Wurzel 1963, *In:* Lister 1987). In the alluvium the banks of the Save River are slightly higher than the surrounding country (Swift 1962) forming numerous seasonal pans on the adjacent flood plain. The Gunundwe and Msaizi Rivers and other smaller seasonal streams discharge via these pans and small drainage channels instead of directly into the Save River. Only the Turgwe River flows directly into the Save River.

Physiographically, Sango Ranch consists of a flat plain in the east, which dips in a southeasterly direction towards the Save River (Figure 3). The altitude ranges from 780 m above sea-level in the northwest to 430 m above sea-level in the southeast at the Save River. To the west the terrain is hillier than the east with large angular koppies in the northwest and scattered hogs-back koppies to the south of the latter, of which Chanurwe (748.1 m) and Vumba (780 m) are the most notable. Other physiographic features of interest include the alluvial plain with its numerous seasonal clay pans; major drainage channels such as the Makore, Saindota and Msaizi Rivers; and Chinga and Sune Pan. In the northeastern corner of Sango Ranch a raised levee forms a ridge east of Chinga Pan that stretches southwards, running parallel to the Save River (Broderick 1997). The sand bed of the Msaizi River ends about 2.5 km from the Save River at the western extremity of the Save River alluvium. According to Broderick (1997) the floodwaters of the Msaizi River splay out at this point and then coalesce in a southerly direction into the so-called Msaizi River extension. The splaying out of the water is probably caused by a slowing down effect resulting when the water course meets the Save River alluvium. The Msaizi River extension then flows parallel to the Save River for 6 km before flowing into it. Coincidentally, the end of the Msaizi River channel lies directly above the Musikavahu Fault but this does not contribute to the outward splaying of the floodwaters (Broderick 1997). The Chinga Pan, of which only the southern tip lies on Sango Ranch, takes its water recharge from the Gunundwe River and its tributaries. The series of pans of Sune

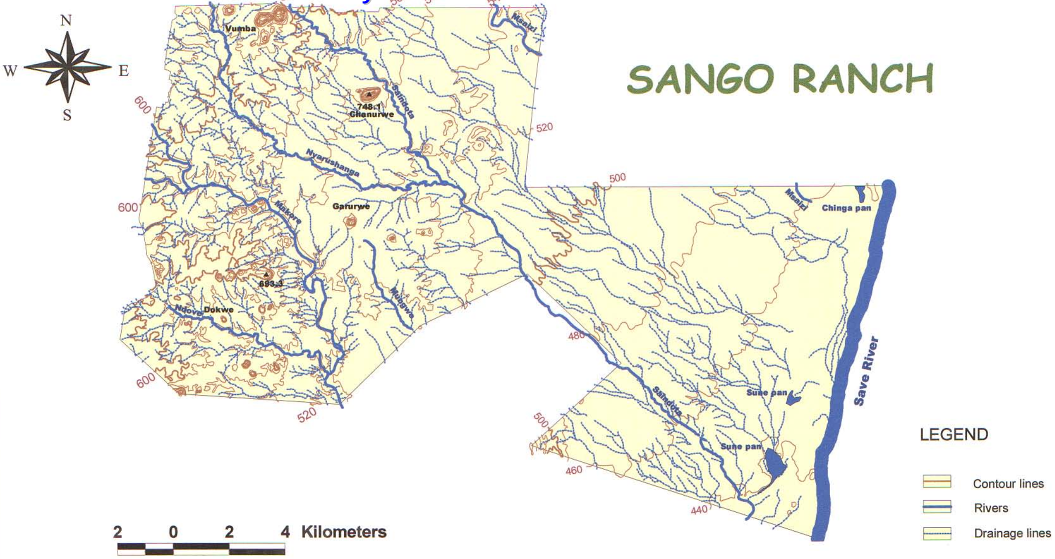


Figure 3: Topographical map of Sango Ranch, Save Valley Conservancy, Zimbabwe.

Pan are recharged from streams flowing towards the Save River alluvium north of the Saindota River and south of the Msaizi River. According to Broderick (1997) the series of pans of Sune Pan do not receive any water from the Msaizi River. All of the pans mentioned above are associated with deep vertisol muds that retain their water throughout most of the wet season. A broad alluvial belt supporting an open grassland is associated with the Saindota River and begins as a narrow ribbon to the north of Chanurwe Hill, becoming gradually wider towards the southeast. This alluvial belt then extends in a southerly direction just south of Sune Pan into the Bedford Block (Figure 2).

GEOLOGY

The first known account of the geology of the Save River Valley is by Thiele in 1914. This account was published in 1915 (Swift 1962). After Thiele, several geologists produced papers and maps on the geology of the area, including Mennell (1920, 1938), Maufe (1922), Teale (1924), The Victoria Prospecting Company (1932), Phaup (1937) and Swift, White, Wiles and Worts (1953). These authors are all quoted in Swift (1962). Recent geological observations were made by Brandl (1992) and Broderick (1997).

A graphic representation of the geological formations found on Sango Ranch appears in Figure 4 and is adapted from maps given by Brandl (1992) and Broderick (1997). The oldest rocks in the Save Valley Conservancy belong to the Basement Complex which was formed during the Precambrian period, 3 350 to 2 350 million years ago (Bond 1965). These rocks consist of the granites with schist intrusions, gneisses and granitic gneisses (Swift 1962). In the southern parts of the Save Valley Conservancy the granites and included portions of Basement schists falling within the Limpopo Mobile Belt have been converted to highly contorted granitic gneisses by being subjected to a later regional metamorphism in the form of tectonism. A narrow band of Basement Complex gneiss was not subjected to Limpopo Mobile Belt tectonism and lies between the Limpopo Mobile Belt and the unmetamorphosed granite in the north. The division between the granite in the north and the granitic gneisses and granulites in the south is a sharply defined east-north-east thrust-defined contact which lies just north of Chanurwe Hill at the boundary between the Sango and Chishakwe Ranches (Figure 4). These granites are the oldest rocks in the area and form a broken country characterised by koppies. The granitic gneisses include basic gneisses and granulites and form a flatter landscape than in the Basement Complex with fewer koppies, the koppies being of the hogs-back type. The granitic gneiss is wound into tight anticlines and synclines which clearly show an intricate system of

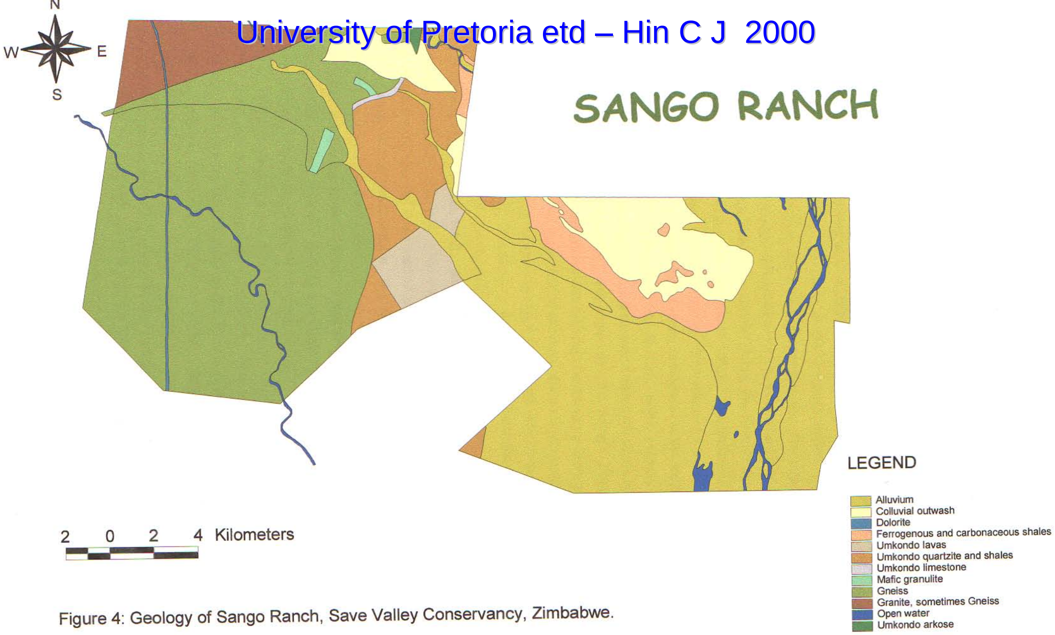


Figure 4: Geology of Sango Ranch, Save Valley Conservancy, Zimbabwe.

folding (Swift 1962) (Figure 4). The granite is intruded by north-north-west trending dolerite dykes that correlate with what is known as the Sebanga Poort Trend (Broderick 1997). One of these dykes is located in the west of Sango Ranch (Figure 4). Other rocks similar to dolerite are found throughout the southern area and are highly metamorphosed, but outcropping as dykes and sills intrusive into the granitic gneiss prior to metamorphism. After metamorphism of the granite and schists the area was reduced to a regular peneplain by a long period of erosion (Swift 1962). The rocks of the Umkondo System consist of quartzites, lavas, shales, arkoses, limestones and sandstones. The rocks of the Umkondo System were laid upon this peneplain after submergence beneath a shallow sea. The Umkondo System was formed during the Early Pre-Cambrian period, 1 600 to 1 900 million years ago (Bond 1965). The Umkondo System occurs in down-folded troughs and runs from the northeastern corner of the Save Valley Conservancy south of Birchenough Bridge, southwards to the south of the Turgwe River (Swift 1962). The Umkondo System, which consists of the Umkondo lavas and Umkondo quartzites and shales, crosses the centre of Sango Ranch southwards into the Umkondo Lease (Figure 4). According to Swift (1962) much of the Umkondo System in the Save Valley Conservancy is covered by alluvium. It is speculated that the extensive alluvium of the mid-Save River area was recently deposited during meandering of this river prior to its stabilisation in its present course (Swift 1962). The alluvium was deposited during the Quaternary period, 2 million years ago (Bond 1965). The alluvium appears to be mostly derived from granite (Swift 1962). Most of the eastern half of Sango Ranch consists of alluvium (Figure 4). The limestones show oölithic texture and the sandstones are frequently ripple-marked which provides evidence that a water body of some sort once existed there. The basic lavas overlie the limestones and sandstones and contain interbedded sandstones near the base. In a few areas the Umkondo lavas are overlain with red shales and sandstones. The Umkondo System has suffered extensive faulting and is mostly of post-Karoo age while some of it is probably pre-Karoo. The Mapari Series is found in the north of the Save Valley Conservancy and although it overlies the beds of the Umkondo System it is regarded as being separate from the Umkondo System. Swift (1962) regards the Umkondo System to be similar to the Transvaal System and the Mapari System to be similar to the Rooiberg Series, both found in South Africa. Much of the Umkondo System was removed by erosion, and the Karoo System was overlain on top of the Umkondo beds (Swift 1962). The Karoo System dates from 225 to 270 million years ago, during the Triassic to Permian periods (Bond 1965). Much of the Karoo System has been stripped by subsequent erosion and only patches of conglomerate, grit, sandstone and shale remain (Du Toit and Price Waterhouse 1994). Shale, grits and conglomerates of the Karoo Supergroup are seen to outcrop about 2 km downstream of the Sango Ranch Headquarters along the Msaizi River (Broderick 1997) (Figure 4). The rocks of this group weather as a surface deposit and occur in a feldspathic grit matrix of rounded quartz pebbles. The Save Valley appears to be a pre-Karoo feature, carved by erosion along the line of pre-Karoo faulting, and the Lower Karoo beds show unconformable overlap in a northerly direction (Swift 1962).

SOILS

The soils of Zimbabwe generally fall into two main categories. They are: lightly textured sandy soils, and medium to heavy textured loams and clays (Rattray 1957). Sandy soils with a low fertility are derived either from acidic rocks such as granite, or from sedimentary sandstones or paragneiss. The heavier loams and clays originate from basic igneous rocks such as dolerites or from various other sedimentary sediments. Black vlei soils are widespread, and possess a high fertility. The soils all bear a close relationship to the underlying rocks, and are classed as immature soils (Swift 1961). Mature soils are found only on flat ground. Ellis (1950) named the soils of the Save River Valley the Mopani soils. These soils are associated with the mopane *Colophospermum mopane*. According to Ellis (1950) the Mopani soils on the west bank of the Save River are of three types: alluvial soils derived from granite and the Umkondo System; or fine, clinging Permian soils derived from quartzites and sandstones; or black, heavy basalt soils. Mopani soils generally have a sandy eluviated A-horizon, which may vary from 25 mm to 150 mm or more in depth.

The soils of the Save Valley Conservancy are strongly related to the underlying geology (Du Toit and Price Waterhouse 1994). Thompson (1965) identified three main soil orders in the area of the Save Valley Conservancy. The soils of the Calcimorphic Order consist of unleached soils, with large reserves of weatherable materials. The Siallitic Group consists of calcimorphic soils that vary from shallow to moderately shallow soils formed on miscellaneous rock types, to deep siallitic soils on alluvium and colluvium. The clay fraction of the fersiallitic soils consists either of illite or poorly crystalline illite to montmorillonitic mixed with layer minerals, mainly in a 2:1 lattice (Thompson 1965). Base saturation is generally over 80 percent. An accumulation of illuvial calcium is sometimes found in the lower solum or underlying layer. The soils on paragneisses, gneisses, and granites are shallow, medium-grained, siallitic loamy sands with an inherent fertility (Du Toit and Price Waterhouse 1994). On the mafic paragneisses the soils are redder and more heavily textured than the paragneisses and on the granites the soils are lighter and sandier. Deep siallitic soils are found in the region of the

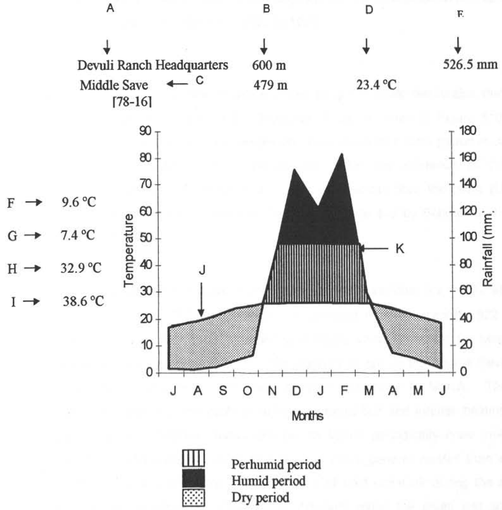
Save River alluvium and possess a particularly high phosphate status. This is probably due to several alkali ring complexes found upstream. The soils on Karoo and Umkondo sediments are similar to those on the granites and granulites but are shallower and usually possess a low infertility.

The soils of the Kaolinitic Order are moderately to strongly leached, with a clay fraction consisting mainly of kaolinite with appreciable amounts of free sesquioxides of iron and aluminium (Thompson 1965). The Fersiallitic Group are kaolinitic soils ranging from fersiallitic red granular clays formed on ultrabasic and basic rocks to fersiallitic, predominantly sandy soils formed on siliceous rocks. Fersiallitic soils tend to be formed on parent materials that give rise to sandy soils mainly in areas of low rainfall. Such soils possess appreciable amounts of weatherable mineral reserves and have a base saturation of more than 40 percent. The clay fractions contain some 2:1 lattice minerals.

The soils of the Halomorphic Order contain significant amounts of exchangeable sodium and/or water-soluble salts. The Sodic Group consists of halomorphic soils that morphologically resemble solonetz and solodized-solonetz. However, their genesis is different. Lateral water movement across the surface of the dense impermeable sodic horizon is thought to be responsible for the very abrupt change between surface and sub-surface soils. Soils vary from strongly sodic to weakly sodic to saline. Highly sodic soils with a low impenetrability are found in some areas of the alluvium with diffuse drainage (Du Toit and Price Waterhouse 1994). Sodic soils are found along drainage lines due to the low rainfall causing insufficient removal of sodium-rich bases and clays from the bottom of the soil catena (Thompson and Purves 1978, *In:* Du Toit and Price Waterhouse 1994).

CLIMATE

The southeast Lowveld of Zimbabwe falls in the BSh climatic zone when using the Köppen classification (Schulze and McGee 1978). This zone is arid and possesses a dry hot steppe climate with a mean annual temperature of above 18 °C. Invasions of cool moist air from the southeast occur during the late dry season, giving rise to slight precipitation and marked drops in day time temperatures. The Save River Valley is characteristically hot and arid (Swift 1962). A climatogram for the Middle Save River Valley appears in Figure 5. The rainfall figures are from the Devuli Headquarters rainfall station (Latitude 20° 08'



A = weather station
B = altitude (m)
C = duration of observations in years, for rainfall and temperature, respectively)
D = mean annual temperature (°C)
E = mean annual rainfall (mm)
F = mean daily minimum temperature of the coldest month (°C)
G = absolute minimum temperature (°C)
H = mean daily maximum temperature of the hottest month (°C)
I = absolute maximum temperature (°C)
J = mean monthly temperature (°C)
K = mean monthly rainfall (mm)

Figure 5. Climatogram for the Middle Save River Valley, Zimbabwe from 1922 to 1999 as derived from the Middle Save River weather station (Latitude 20° 13' S, Longitude 32° 23' E, altitude 479 m) and the Devuli Headquarters rainfall station for the period 1977 to1993 (Latitude 20° 08' S, Longitude 32° 06' E, altitude 600 m).

S, Longitude 32º 06' E, Altitude 600 m above sea level)[1] and were recorded from 1922 to 1999. The temperature figures were attained from the Middle Save River weather station (Latitude 20º 13' S, Longitude 32º 23' E, Altitude 479 m above sea level)[1] and were recorded from 1977 to 1993.

Rainfall

The rainfall of Zimbabwe is characterised by a unimodal distribution during the summer months (Farrell 1968). However, it can be seen in Figure 5 that two peaks in rainfall appear in December and February with a drier period in January. Southern Zimbabwe is more persistently under the influence of the drier southeasterlies and so receives a much lower rainfall than the north (Lineham 1965). The southeast Lowveld is classified as semi-arid by Schulze and McGee (1978).

Rainfall for the Middle Save River Valley is highly variable (cv = 30.2%) with a mean rainfall of 526.5 mm per annum received over the period 1922 to1999 (Figure 5).[1] Du Toit (1990b) reported a highly variable rainfall for Msaizi and Gunundwe Ranches (cv = 33%). The majority of rain in the Middle Save River Valley is received during the summer from November to March. The more southerly position of the subtropical high pressure belt and intense heating of the interior of the continent during October to March periodically draw moister air masses into Zimbabwe, giving heavier and more general rainfall than at other times (Lineham 1965). Periodic incursions of cold moist air during the summer months are induced by increasing air pressure along the south and southeast coasts of southern Africa and enter the southeast Lowveld of Zimbabwe by major gaps in the plateau edge, mainly the Limpopo River Valley (Lineham 1965). Orographic rain or drizzle then occurs on all the windward-facing slopes. This is locally known as 'guti'.

The Middle Save River Valley experiences periodic droughts. Somerville (1976) reported a series of droughts in the 1930's, and a disastrous drought in 1946/1947 when a total rainfall of only 321.6 mm was recorded. The most recent and the historically most severe drought occurred in the 1991 to 1992 rain season when a total of only 156.5 mm of rainfall was recorded at Devuli Ranch Headquarters. The highest recorded rainfall was 901.5 mm which fell in the season of 1922 to 1923. According to Schulze and McGee (1978), the southeast Lowveld of Zimbabwe experiences an annual rainfall surplus of less than 100 mm. According to Du Toit and Price Waterhouse (1994), the rainfall is higher in the hilly western

[1] Zimbabwe Meterological Services, PO Box BE 150, Belvedere, Harare, Zimbabwe

areas of the Save Valley Conservancy than elsewhere, because these areas are less influenced by the rainshadow created by the Chipinge Highlands to the east.

A cyclical rainfall pattern occurs and Figure 6 shows the variation from the mean annual rainfall for Devuli Headquarters over a 78-year period. A polynomial regression revealed a quasi 20-year rainfall oscillation in which approximately 20 years of below average rainfall are followed by another 20 years of above average rainfall. Tyson (1978) demonstrated a quasi 20-year oscillation in rainfall that coincided with similar but inverse temperature oscillations for the summer rainfall areas of South Africa. From Figure 6 it is evident that a period of above average rainfall is currently being entered into. Significantly, the rainfall in March 1999 was reported as being above average for about 80 percent of Zimbabwe (Zimbabwe Meteorological Services 1999).

Provided that the rhythm and pattern of rainfall oscillations over the past 78 years continues to repeat itself, it can be expected that the wetter period currently being experienced will persist for the next two decades. However, some periods of below average rainfall and even drought may still occur within this period. The oscillatory nature demonstrated here will have important implications for the management program of Sango and this will be discussed in Chapter 11.

Temperature

Although relief influences the main temperature pattern, the relative accessibility to invasions of cold air is also of importance (Torrance 1965b). Such invasions of cool moist air from the southeast occur in most months of the year at one- to two-weekly intervals. Because of their associated cloudiness they affect the temperature conditions materially. Cloudy cool days are more common in the southeast Lowveld of Zimbabwe because the central watershed of Zimbabwe forms a natural weather boundary. The Middle Save River Valley lies between the 30 °C and 32.5 °C isotherms for summer and between the 7.5 °C and 10 °C isotherms for winter (Schulze and McGee 1978).

Maximum temperatures for the Middle Save Valley vary between 25.5 °C and 26.6 °C during June to July and between 32.4 °C and 32.9 °C during October to January, with an annual mean maximum of 30.5 °C (Figure 5).[1] Minimum temperatures range from 9.6° C to 10.7 °C during June to July and from 17.3 °C to 20.8 °C during October to January with an annual mean minimum of 16.3°C. The highest and lowest temperatures recorded for the Middle Save River area over the period 1977 to 1993 are 38.6 °C in January and 7.4 °C in July, respectively. Frost is rare in the Save River Valley (Farrell 1968).

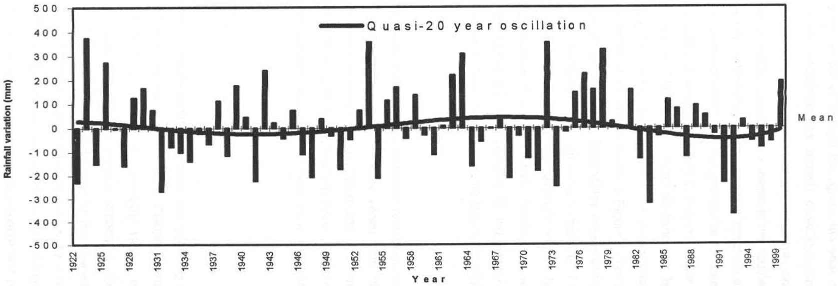


Figure 6. The actual variation from the mean annual rainfall for the Middle Save River Valley, in Zimbabwe as recorded at the Devuli Headquarters rainfall station (Latitude 20° 08' S, Longitude 32° 06' E, Altitude 600 m above sea level) from 1922 to 1999.

Sunshine and humidity

Variations in the length of daylight throughout the year are comparatively small (Torrance 1965a). Meteorological records show that Zimbabwe can expect an average of 8 to10 hours of sunshine per day in summer and about 6 hours per day in winter (Rattray 1957). Sunniness is lowest in the southeast of Zimbabwe due to the cloudy weather which results from periodic moist air invasions. However, the Save Valley experiences the greatest sunniness of the southeastern Lowveld. The total sunshine hours received from May to October in the southeast of Zimbabwe ranges from 1 500 to 1 600 hours. From November to April it ranges from 1 300 to 1 400 hours. The mean daily sunshine per month recorded in the Save River Valley over a period of 13 years is shown in Figure 7 (Torrance 1965a). The mean daily sunshine per month for the Save Valley ranges from 6.0 hours in December to 9.5 hours in September with an annual mean of 7.9 hours. The periodic invasions of moist air maintain a high average relative humidity of the air in the southeast of Zimbabwe (Torrance 1965a). The 24-hour relative humidity of the air for the southeast Lowveld varies between 65 and 70 percent during November to April and between 50 and 55 percent during May to October (Torrance 1965a).

Solar radiation

The incoming solar radiation flux densities recorded over a period of 10 years (1963 to 1973) in southeastern Zimbabwe varied from 160 to 170 x 10^5 Jm^2 per day for winter (June-August) and from 220 to 230 x 10^5 Jm^{-2} per day (Schulze and McGee 1978). These values are relatively lower than the rest of the country and are due to the periodic invasions of moist air in the southeast causing radiation attenuation.

VEGETATION

The vegetation of southeastern Zimbabwe can generally be classified as a sweet *Colophospermum mopane* savanna or a *Colophospermum mopane* woodland (Rattray 1957; Rattray 1961; Rattray and Wild 1968). Henkel (1931) called the vegetation the *Colophospermum mopane* Woodland Zone and reported almost pure stands of *Colophospermum mopane* in the Lowveld of the then Southern Rhodesia, now Zimbabwe, interrupted in places by low hills and ridges where *Colophospermum mopane* occurred mixed with other trees. Henkel (1931) noted that the understorey of grass was unusually sparse and poorly developed. White (1983) classified the greater part of the vegetation of southeastern Zimbabwe as a deciduous Zambesian mopane woodland and scrub woodland with an area of semi-deciduous Zambesian miombo woodland dominated by *Brachystegia* spp., either alone or with *Julbernardia* spp. to the north. The vegetation of the alluvial

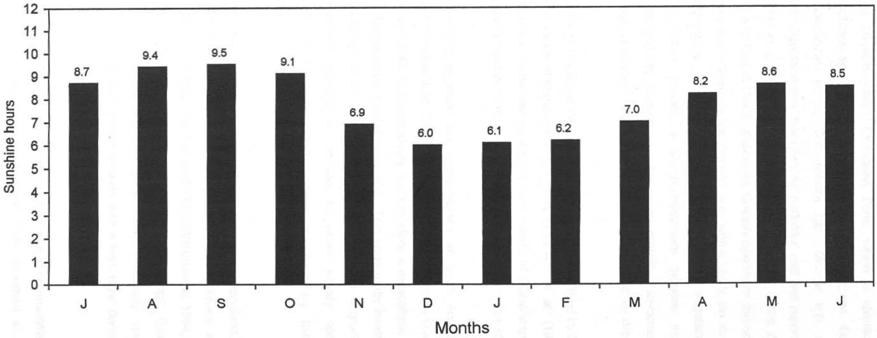


Figure 7. Mean daily sunshine hours per month recorded in the Save River Valley, Zimbabwe over a period of 13 years (Torrance 1965).

basin of the Save River Valley was broadly categorised by Rattray and Wild (1955) as a Tropical Valley Thornbush Zone, which is characterised by the presence of *Acacia* spp., *Dichrostachys cinerea* subsp. *africana*, *Colophospermum mopane*, *Sclerocarya birrea*, *Commiphora* spp., *Grewia* spp. and *Adansonia digitata*. The vegetation was described as 'park-like' and was reported by Wild and Rattray (1955) as showing remarkable similarities to that of the Zambezi Valley. Wild (1955) and Farrell (1968) described *Colophospermum mopane* as being the dominant tree in the Save-Runde junction area which lies to the south of the Save Valley Conservancy. Wild (1965) identified four general vegetation types in the Save River Valley, namely a *Colophospermum mopane* tree savanna, a *Terminalia sericea* tree savanna, a *Julbernardia globiflora* savanna woodland, and a *Brachystegia spiciformis* - *Julbernardia globiflora* savanna woodland.

The vegetation of the Save Valley Conservancy was described by Du Toit (1990b), Du Toit and Price-Waterhouse (1994) and Goodwin *et al.* (1997). An open mopane woodland dominated by almost pure stands of *Colophospermum mopane* with a poor herb layer is found on alkaline clays and shows a low species diversity.

On soils overlying gneisses and paragneisses an open *Acacia* - *Combretum* Woodland dominates (Du Toit 1990b; Du Toit and Price-Waterhouse 1994; Goodwin *et al.* 1994). Soils are sandy and therefore a mesophytic community has developed. Grass cover is relatively good. This community intermingles with the mopane woodland at the bottom of the slopes, where a gradual increase in *Colophospermum mopane* in relation to other woody species is seen. Consequently, it is difficult to demarcate a boundary between the two communities.

A tall almost closed *Acacia tortilis* subsp. *heteracantha* woodland is found on the heavy, deep alluvial soils of the Save and Turgwe Rivers and their major tributaries (Du Toit 1990b, Du Toit and Price-Waterhouse 1994; Goodwin *et al.* 1997). The understorey often forms thicket-like clumps. Grass species are palatable. On old abandoned lands invasive woody species such as *Dichrostachys cinerea* form dense thickets with a herb layer dominated by weedy forbs.

On shallower alluvial plains, considerably intermingled communities are found (Du Toit 1990b; Du Toit and Price-Waterhouse 1994; Goodwin *et al.* 1997). The dominant species include *Acacia xanthophloea* and *Salvadora persica.* Trees such as *Xanthocercis zambesiaca, Kigelia africana, Trichilia emetica, Combretum* *imberbe* and *Lonchocarpus capassa* are common in these communities and their abundance increases towards the major rivers.

A riverine fringe woodland occurs as a dense riparian community growing on consolidated alluvium along the banks of the larger rivers (Du Toit 1990b; Du Toit & Price-Waterhouse 1994; Goodwin *et al.* 1997). A number of large evergreen trees form a closed canopy under which a dense understorey and lianas are found.

A hilltop woodland and thicket is found on granite and granulite koppies with *Brachystegia glaucescens, Adansonia digitata, Kirkia acuminata, Afzelia quanzensis, Ficus abutilifolia, Ficus tettensis, Entandrophragma caudatum, Combretum apiculatum* subsp. *apiculatum, Sclerocarya birrea* and *Xeroderris stuhlmannii* as conspicuous species (Du Toit 1990b; Du Toit & Price-Waterhouse 1994; Goodwin *et al.* 1997). *Brachystegia glaucescens* also occurs in groves on interfluves on undulating granulitic terrain with pockets of sandy soil, as well as in areas of Umkondo and Karoo sediments.

On some interfluves with relatively deep, sandy soils, a mixed sandveld or open woodland occurs in place of *Brachystegia glaucescens* groves (Du Toit 1990b; Du Toit and Price-Waterhouse 1994; Goodwin *et al.* 1997). Dominant trees are *Terminalia sericea, Combretum apiculatum* subsp. *apiculatum, Sclerocarya birrea, Strychnos* spp., *Cissus cornifolia, Flacourtia indica* and with *Julbernardia globiflora* and *Pseudolachnostylis maprouneifolia* being less common. The grass cover is variable.

ANIMALS

The Save River Valley was once noted for its large animal concentrations (Somerville 1976). Somerville (1976) mentions large herds of elephant, eland, sable antelope, kudu, zebra and impala that occurred there in the 1920's. Near running water hippopotamuses and waterbuck existed and in thick forest buffalo herds roamed. Lichtenstein's hartebeest, roan antelope, reedbuck, klipspringer, bushbuck, duiker, Sharpe's grysbok, bushpig and warthog were also present. Rhinoceroses, black and white, were rare. Over the years the wildlife populations were eradicated as they were seen as a danger to livestock. Lichtenstein's hartebeest and roan antelope were the first to become rare. Leopards, lions and other large carnivores were common and a predator eradication policy was adopted from the outset. The predators, especially lions, leopards and wild dog, were shot, trapped and poisoned. In the second year of operations a lion problem still existed but Somerville (1976) noted that the lions did avoid certain areas. The lion, cheetah, spotted hyaena and wild dog populations were greatly reduced but a healthy leopard population survived. Elephants were little hunted in the early days because they did little damage. During the 1950's elephant populations increased drastically and the Game Department of the then Southern Rhodesia was asked to control these animals. Buffalo and hippopotamus numbers were also controlled during this period (Meadows 1996). During the 1970's cattle fencing was erected and a programme to eradicate both buffalo and elephant was implemented in response to the Department of Veterinary Services' request that all foot-and-mouth disease risks be reduced (Du Toit and Price Waterhouse 1994). All buffalo and all but five elephant were exterminated in the Middle Save River area. According to Somerville (1976) foot-and-mouth disease first appeared on Devuli Ranch in 1931. In 1976 lions and spotted hyaenas still existed in the area. Sensitive grazers such as sable antelope and roan antelope were unable to compete with the cattle, and sable antelope were only able to survive in the southeast of what is today the Save Valley Conservancy, while roan antelope became extinct in the area. Hunting was practised throughout the period as a means of reducing wildlife competition with cattle (Goodwin *et al.* 1997).

Prior to the formation of the Save Valley Conservancy, game restocking was limited to small numbers of animals. A small number of white rhinoceros were established on Humani Ranch during the mid-1970's through introductions and strays from other populations in Zimbabwe. These other rhinoceros populations had in turn been created through the importation of white rhinoceros from Kwazulu-Natal in South Africa (Du Toit and Price Waterhouse 1994). Prior to 1991 small numbers of giraffe, waterbuck, nyala and tsessebe were reintroduced to Humani Ranch and a small number of elephant calves came from culling operations in Gona-re-zhou National Park and joined the existing herd thus bringing their number to approximately 60. The drought in Gona-re-zhou and a consequent translocation increased the elephant numbers to approximately 700 at the end of 1996 (Goodwin *et al.* 1997). The changes that had been brought about in the vegetation by cattle ranching created habitat suitable for the black rhinoceros and 20 black rhinoceroses were translocated from the Zambezi Valley to Humani Ranch in 1986, 1987 and 1988, on loan from the Department of National Parks and Wildlife Management. The danger of poaching created the need for a co-ordinated programme for the protection and monitoring of these animals and this was a major catalyst in the formation of the Save Valley Conservancy (Du Toit and Price Waterhouse 1994). During 1993 further black rhinoceroses were brought into the Save Valley Conservancy and the population has since increased by natural recruitment to the latest figure of approximately 60. Since 1991 some 1 600 animals have been brought into the Save Valley

Conservancy. Waterbuck, sable antelope, giraffe, Burchell's zebra, blue wildebeest and buffalo were reintroduced into the Save Valley Conservancy in 1993 (Goodwin *et al.* 1997). Buffalo were to play an important role in the transformation of the Save Valley Conservancy from cattle ranching to full-scale wildlife ranching. Buffalo were only released into the Save Valley Conservancy in January 1996 due to veterinary restrictions relating to foot-and-mouth disease.

Today many of the larger ungulates are present in healthy numbers (Table 1). However, warthog and bushpig numbers were severely reduced by the drought of 1991 and 1992, and Burchell's zebra and hippopotamus numbers were also affected (Goodwin *et al.* 1997). Rare antelope present include the nyala, sable antelope, tsessebe and Sharpe's grysbok. Healthy numbers of predators exist in the Save Valley Conservancy. Besides a large leopard population, lion, cheetah and spotted hyaena have all returned and wild dogs have appeared. According to Pole (pers. comm.)[2], three wild dog packs have returned to the Save Valley Conservancy. Both spotted hyaena and lion numbers are low, however, with a single lion pride residing on Senuko Ranch.

The Save Valley Conservancy plans to restock rare animals such as Lichtenstein's hartebeest and roan antelope in the near future (Goodwin *et al.* 1997). Each property in the Save Valley Conservancy is restocking animals on an on-going basis as they become available, although a planned stocking rate does exist for the area.

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Table 1. Large mammal population estimates for the Save Valley Conservancy, Zimbabwe (Goodwin *et al.* 1997).

ANIMALS	*ESTIMATED POPULATION SIZE*	
	1992	*1996*
Buffalo	38	350
Cheetah	12	50
Crocodile	-	200
Eland	1500	2200
Elephant	50	700
Giraffe	30	300
Hippopotamus	15-20	30
Impala	40 000	60 000
Klipspringer	300	400-500
Kudu	12 000	15 000
Leopard	200	250
Lion	-	4
Nyala	120	200
Ostrich	3	-
Rhinoceros, Black	-	60
Rhinoceros, White	4	6
Sable antelope	20	150
Tsessebe	25	100
Waterbuck	200	300
Wild dog	40	80-100
Wildebeest, Blue	100	200
Zebra, Burchell's	1500	2000