

Introduction

Swaziland is a landlocked country covering a total area of approximately 17,360 km². It is surrounded by South Africa to the north, west and south, and Mozambique to the east. It lies between latitudes 25° 43' and 27°19' South, and longitudes 30° 47.5' and 32° 06' East. Altitude ranges from over 1,860 m in the northwest down to 120 m in the east.

Although small, Swaziland supports a large variety of landscapes, geology, climate, and corresponding habitat and biodiversity. With its divergent geology, climate, and subsequent landforms, the physiographic regions within the country's boundaries are very distinct.

Soils

The deeply weathered soils of the Highveld and Upper Middleveld are characterised by relatively acidic soils and high clay content, whereas the Lower Middleveld and Lowveld are generally only moderately weathered, shallow, and show a wide range of soil characteristics with neutral or basic soils. Soils on the Lebombo Plateau show more intensive weathering characterised by high clay contents (Rommelzwaal, 1993).

Climate

Swaziland has a typically subtropical climate with summer rains (October–March) and distinct seasons. The physiographic zones described above show clear climatic links with sub-humid and temperate conditions with a typical annual rainfall ranging from 1,450 mm in the Highveld to semi-arid and warm conditions with an average annual rainfall of 550 mm in the Lowveld.

Highest January mean maximum temperatures are recorded in the Eastern Lowveld (34°C at 200

m asl), and lowest in the Highveld (22°C at 1,450 m asl). The lowest July minimum temperatures range from 5°C–10°C. Frost is recorded most frequently in the Highveld.

Hydrology

The four main perennial river systems, which drain the country from the west to the east, are the Komati, Mbuluzi, Lusutfu, and Ngwavuma. Gorges and incised river valleys are predominant features of these watercourses, each of which supports a variety of habitats and flora. Much of the riparian vegetation in the country has been altered by various flooding events—large trees have been swept off riverbanks and channels remoulded. Exotic invaders have since established themselves along the banks and are working their way into the surrounding vegetation having a significant impact on the country's biodiversity.

Physiographic zones

Influenced by soil and erosion processes, Swaziland has been classified into six physiographic zones (Murdoch, 1970; Rommelzwaal, 1993).

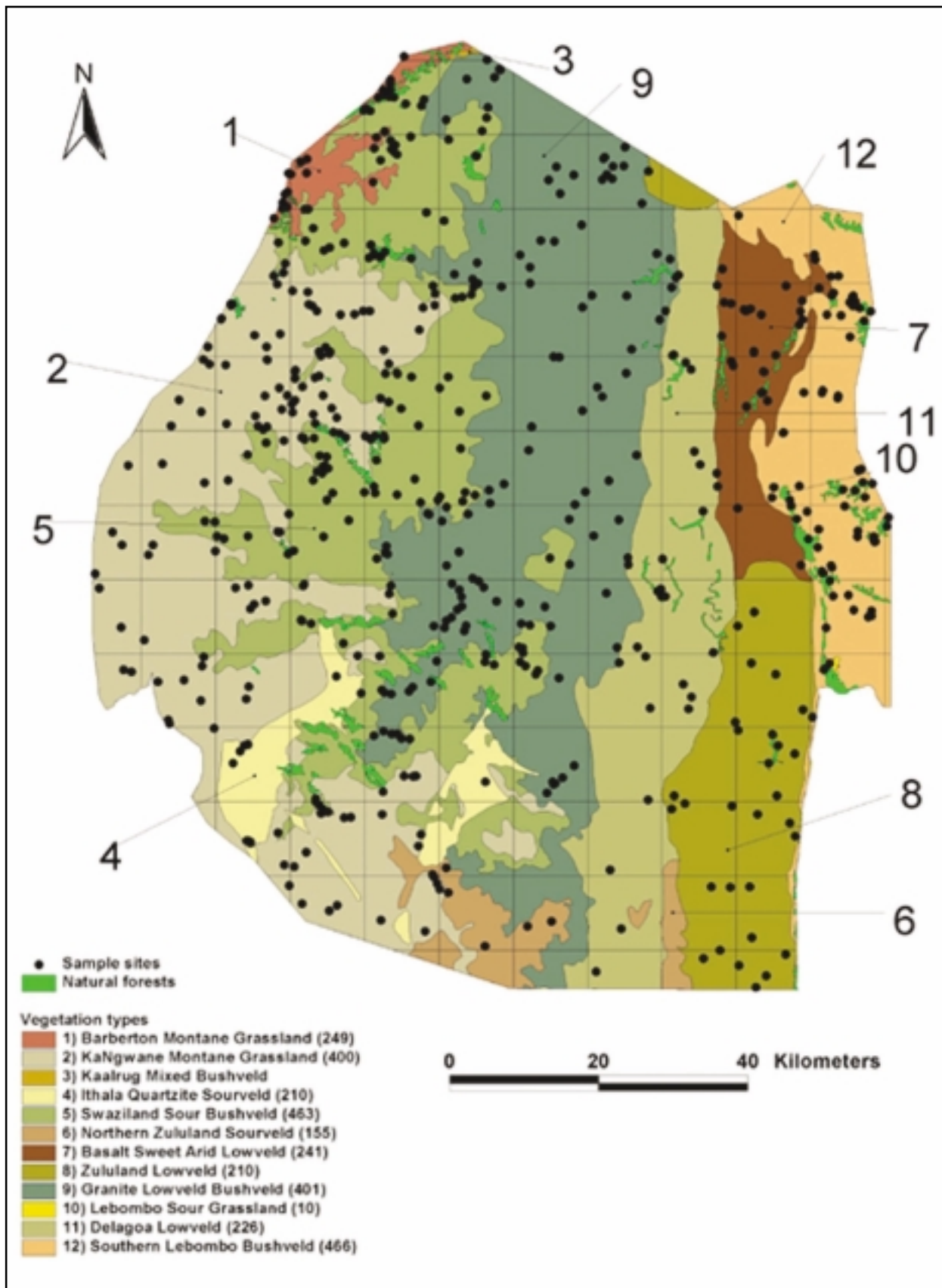
Maps 1 and 2 illustrate vegetation and elevation boundaries, which coincide significantly with the physiographic boundaries.

The Highveld

The Highveld physiographic zone lying in the west of the country is dominated by short grassland on rocky outcrops dissected by narrow gorges and river valleys. Small pockets of species-rich afro-montane forest can be found along the mountain ranges, many of which lie above the mist belt line (examples include Mgqwayisa forest in northern Malolotja Nature Reserve, and Devil's Bridge near

Table 1. Overview of the country's climatic conditions based on long-term averages (from Van Waveren & Nhlengetfwa, 1992a & b).

Physiographic Zone	Mean Temperature (°C)			Rainfall (mm)	
	Annual	Jan	July	Mean Annual	Dependable –80%
Highveld	17	20	12	850–1,400	700–1,200
Upper Middleveld	20	24	15	800–1,000	650–850
Lower Middleveld	21	25	16	650–800	500–700
Western Lowveld	22	26	18	625–725	425–550
Eastern Lowveld	22	27	17	550–625	400–500
Lebombo Ridge	21	26	17	700–825	500–750



Map 1. Map showing Swaziland vegetation (Dobson & Lotter, 2004) with natural forests (Mucina *et al.*, 2005), eighth degree grid squares, sample sites, and total number of tree species per vegetation type.

Table 2. Physiographic zones of Swaziland with altitude, major landforms, and vegetation (Remmelzwaal, 1993; Sweet & Khumalo, 1994).

Physiographic Zone	Altitude(m)	Landform/Topography	Geology	Vegetation Type
Highveld	900–1,800	Hills on steeply dissected escarpment with transitions to plateau	Granite	Short grassland with forest patches
Upper Middleveld	600–900	Hills with plateau remnants and basins	Granodiorite Granite	Tall grassland with scattered trees and shrubs
Lower Middleveld	400–600	Rolling plain with basins and isolated hills	Gneiss	Broad-leaved savanna
Western Lowveld	250–400	Undulating plain	Sandstone/ Claystone	Mixed savanna
Eastern Lowveld	200–300	Gently undulating plain	Basalt	Acacia savanna
Lebombo Range	250–600	Undulating plateau with steeply dissected escarpment	Ignimbrite (Rhyolite)	Hillside bush and plateau savanna

Bulembu). These forests vary in condition with a visible increase in disturbance noted over the last six years. Increased exploitation, greater grazing pressure, pathways, livestock trampling, veld fires, honey gathering, and slash-and-burn bushclearing threaten the natural vegetation. Expansive stands of exotic *Acacia* sp. (Wattle) smother many of the river and stream banks, and infestations of the weeds *Solanum mauritianum* and *Lantana camara* are common in disturbed areas, including industrial timber plantations.

The Middleveld

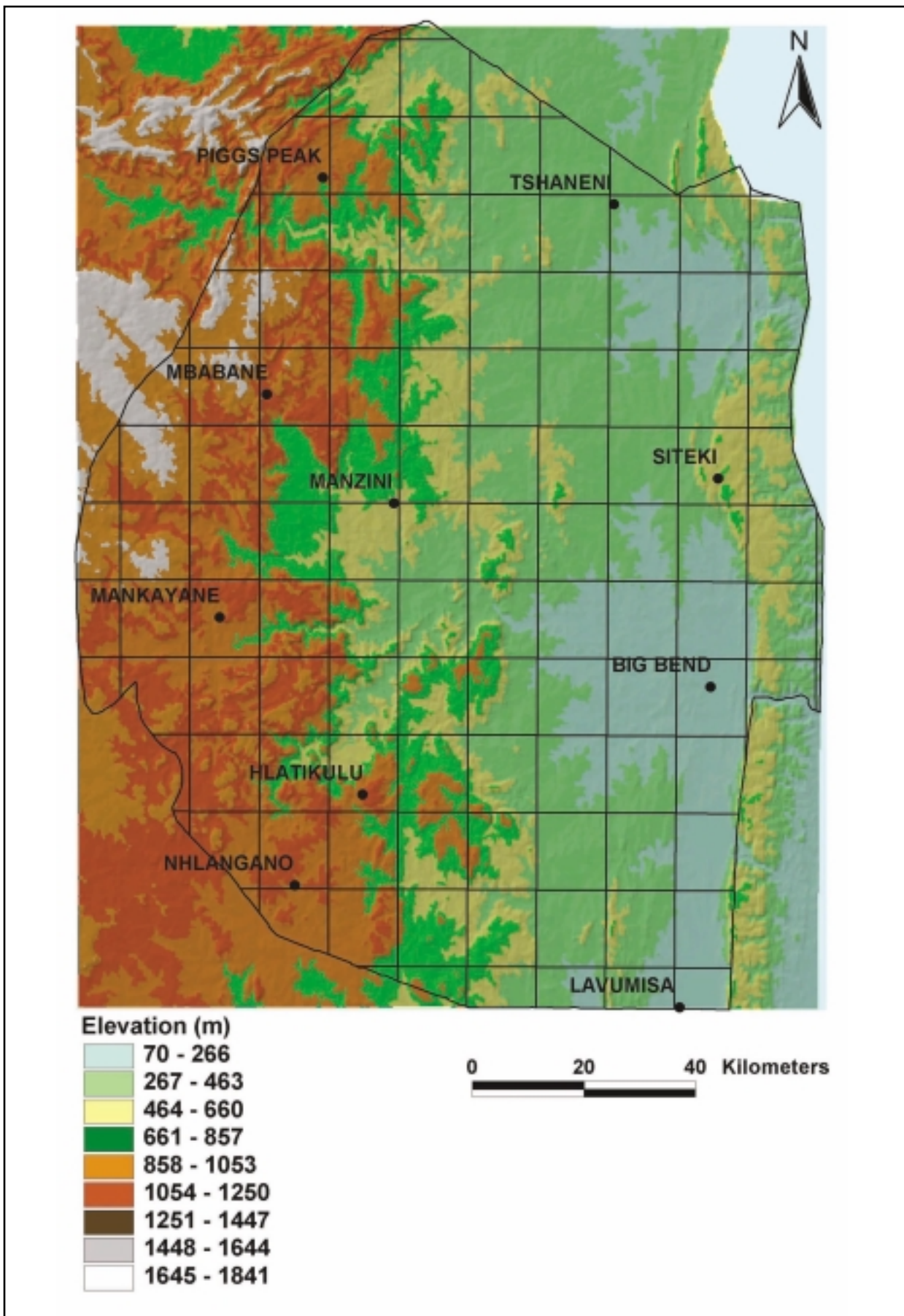
The upper and lower Middleveld regions generally support tall grassland with forest and thicket structures often associated with rocky outcrops. The areas around Ezulwini Valley going down to Mafutseni are good examples. This region of Swaziland is the most heavily settled and the increase in population is having a negative impact on the natural vegetation. Land is continually being cleared for agricultural, rural, and urban developments. The indigenous climber *Acacia ataxacantha* and exotic *Caesalpinia decapetala* have become problem plants and tend to form impenetrable thickets along riverine fringes and in wooded areas. The invasive *Psidium guajava* continues to increase, especially around the hills of Manzini and Malkerns, and the indigenous *Dichrostachys cinerea* has transformed the inherent savanna around Mafutseni into thickets and dense bush, owing, in part, to historic mismanagement of the land.

The Lowveld

As one travels down the gradient towards the western Lowveld, *Combretum—Terminalia* broad leaf savanna typifies the landscape before it merges towards the eastern lowveld with the flatter plains of *Acacia nigrescens* woodlands. Encroaching thicket structures dominated by the native species *Acacia nilotica* and *Dichrostachys cinerea* are common in the Lowveld. The majority of commercial ranches, cotton farms, and sugarcane plantations occur in this region. There are several natural areas earmarked for bushclearing to make way for future agricultural projects. A substantial proportion of fuelwood continues to be indiscriminately harvested, judging by the piles of firewood that are sold along the roadsides.

Riverine forests associated with the major rivers, generally occurring below 800 m, support a closed woodland structure often infringed by thicket. Flooding has transformed many of these structures, leaving them as patchy open shrublands, often associated with reedbeds. Alien invasive plants can be prolific along the low-lying riverbanks, especially the more aggressive weeds, such as *Chromolaena odorata*, *Lantana camara*, and *Melia azedarach*.

Drier *Acacia* woodlands dominate the southeastern portion of the country where rainfall is infrequent. These woodlands include *Acacia tortilis*, *A. borleae*, *A. senegal*, and *A. burkei*. Open rocky outcrops covered with extensive stands of naturally occurring *Aloe marlothii* become increasingly common in this area.



Map 2. Elevation map of Swaziland showing the main cities and towns. Physiographic regions correlate as follows: Highveld between 900–1800 m, Upper Middleveld 600–900 m, Lower Middleveld 400–600 m, Western Lowveld 250–400 m, Eastern Lowveld 200–300 m, and the Lebombo range 250–600 m.

The Lebombo Range

The steep escarpment of the Lebombo Range rises from the flat lowveld, dissected with steep gorges supporting patches of drier scarp forest and *Androstachys* forest. These are largely transitional between the typical 'afromontane' and 'coastal' forest types (Mucina *et al.*, 2005). The escarpment supports a *Combretum*-rich bushveld that thins out to a tall grassy plateau, which is surrounded by rocky outcrops and cliff faces. Bushclumps around rocky outcrops are frequent on the plateau, with the occasional seasonal pan forming in the natural depressions.

A small number of plant species has been noted as only being found in association with *Androstachys* thickets, thus comprising a possible unique plant community. Lebombo forest patches have proved to be very high in relative species richness (Monadjem *et al.*, 2003a), and are becoming increasingly vulnerable from over-exploitation, livestock trampling, path widening, alien weed infestation, and reduced canopy cover. Species are dying back and fires are able to penetrate deeper into the forests. Infestation by alien invasive species is becoming one of the more serious threats in the region, especially that of *Chromolaena odorata*, *Lantana camara* and *Melia azedarach*.

The Lebombo Range, north-western, and south-western Swaziland are vitally important to the conservation of threatened tree species in Swaziland (Monadjem *et al.*, 2003a). Some plant species have been found to be restricted to specific geology formations, including the serpentines of the Barberton Mountains, rhyolites of the Lebombo Range, and quartzites in the south-west.

Centres of Plant Endemism

Floristically, Swaziland is important because it falls within the boundaries of two regional phytochoria, recognized by the World Wide Fund for Nature (WWF) and World Conservation Union (IUCN) as Centres of Plant Diversity and Endemism of global significance (Van Wyk & Smith, 2001). These include the Drakensberg Afromontane Regional System and the Maputaland–Pondoland Region, both of which support high concentrations of endemic taxa.

On a local scale, Swaziland contains a very important subcentre of the Maputaland Centre of Endemism, consisting mainly of the Lebombo Range. The Maputaland Centre of Endemism forms part of the Maputaland–Pondoland Region and, by implication, it is also recognised as a site of global conservation significance as far as floristic diversity is concerned.

The other important area in Swaziland is the north-western region bordering the Barberton Mountains. This region is part of the Barberton Centre of Endemism, a subcentre of the Drakensberg Afromontane Regional System. Hence, a por-

tion of Swaziland is included in floristic regions already recognised as being of global botanical significance.

Relevant legislation

The Swaziland Flora Protection Act of 2000 provides legal protection for over 200 plant species in the country and allows for the creation of flora reserves and protection of special habitats. In the past, the schedules have not been based on plant red data lists for Swaziland, something that is currently in the process of being amended.

This Act protects all flora within proclaimed reserves, but affords little protection outside these. Even though Swazi Nation Land (SNL) harbours many threatened plants, *bona fide* Swazi rural dwellers are permitted to collect and use (but not sell) these species. This is concerning, as the Act does not regulate sustainable harvesting on SNL. The Plant Control Act of 1981 sets out to control and regulate the movement and cultivation of plants, as well as the establishment and operation of plant nurseries. It also deals with the control of plant diseases, plant insect pests, as well as noxious weeds that are moved in and out of the country. The definition of a noxious weed is not clearly stated and the schedule of noxious weeds needs urgent revision.

Another concern is that customs and border officials and inspectors may not be able to identify the species listed in the schedules.

The Forest Preservation Act of 1910 aims at protecting trees and forests on government land and SNL. This is a very outdated Act, allowing destruction of forests and trees under certain conditions without considering the ecological impacts of such destruction. However, a new Forest Bill is in preparation, which will repeal this Act.

Population, land use, and land tenure

The total population of Swaziland in 1996 was estimated at 937,747 with an annual population growth rate of 3.2%. The density distribution across the country (SNPDP 1996–2006) indicates that:

- 70% of people live on SNL
- 23% live in urban areas
- 7% live on individual tenure farms

The majority of people live on SNL, an area typified by subsistence farming and scattered homesteads, making it vulnerable to plant resource utilisation.

Grazing occupies nearly 70% of Swaziland, made up of 50% extensive communal grazing on Swazi Nation Land (SNL) and 20% ranching both on Title Deed Land (TDL) and SNL. Small-scale subsistence agriculture dominated by maize cultivation is a high priority on SNL.

Forestry is another major land use in Swaziland,