# SWAZILAND NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

**(FINAL DRAFT; April 2001)**


## SWAZILAND ENVIRONMENT AUTHORITY
**MINISTRY OF TOURISM, ENVIRONMENT AND COMMUNICATIONS**

P.O. Box 2652
Mbabane
Swaziland

**CONTENTS** **Page**

# Acronyms

| | |
|---|---|
| DFID: | British Department for International Development |
| BIMS: | Biodiversity Information and Management System |
| BSAP: | Biodiversity Strategy and Action Plan |
| CBD: | Convention on Biological Diversity |
| CCD: | Convention to Combat Desertification |
| COP: | Conference of Parties |
| CPGR: | Centre for Plant Genetic Resources |
| DFID: | Department for International Development |
| EE: | Environmental Education |
| EIA: | Environmental Impact Assessment |
| EIS: | Environmental Information System |
| ELMS: | Environment and Land Management Sector (of SADC) |
| ESRA: | Economic and Social Reform Agenda |
| EU: | European Union |
| FAO: | Food and Agriculture Organisation |
| GDP: | Gross Domestic Product |
| GEF: | Global Environment Facility |
| GOS: | Government of Swaziland |
| IUCN: | International Union for the Conservation of Nature |
| KOBWA: | Komati Basin Water Authority |
| MEPD: | Ministry of Economic Planning and Development |
| MOE: | Ministry of Education |
| MNRE: | Ministry of Natural Resources and Energy |
| MOAC: | Ministry of Agriculture and Cooperatives |
| MTEC: | Ministry of Tourism, Environment and Communications |
| NDS: | National Development Strategy |
| NEEP: | National Environmental Education Programme (SNTC) |
| NEF: | National Environment Fund |
| NGO: | Non-governmental Organisation |
| RSA: | Republic of South Africa |
| SADC: | Southern African Development Community |
| SCOT: | Swaziland College of Technology |
| SEA: | Swaziland Environment Authority |
| SEAP: | Swaziland Environment Action Plan |
| SNL: | Swazi Nation Land |
| SNTC: | Swaziland National Trust Commission |
| TDL: | Title Deed Land |
| UN: | United Nations |
| UNDP: | United Nations Development Programme |
| UNFCC: | United Nations Framework Convention on Climate Change |
| UNISWA: | University of Swaziland |
| USAID: | United States Agency for International Development |
| VOCTIM: | Vocational and Commercial Training Institute and Management |
| WB: | World Bank |

# Acknowledgements

The development of the Swaziland National Biodiversity Strategy and Action Plan (BSAP) has been a process carried forward through the participation of a large number of people (the BSAP process is described in section 1.4) whose involvement has been critical to the success of the project.

The Biodiversity Steering Committee and Planning Team members gave selflessly of their time and provided essential support to the respective National Coordinators. Members of these two committees are listed in Annex 1. The basic principles of the strategy were developed by the national consultants and discussed by six technical working groups (participants listed in Annex 1). The contributions made by these people are greatly appreciated. The SEA staff (see Annex 1) were involved in all stages of the development of BSAP. In addition to those mentioned above, a large number of people participated in regional and national workshops. Their large numbers preclude individual mention, but their collective contribution was very significant. Thank you very much. The assistance of the regional consultant and the two international consultants (see Annex 1) are also appreciated. Finally, a word of thanks to the GEF and UNDP for financial support of BSAP.

Ara Monadjem
Bonga S. Nkosi
*National Coordinators.*

# Executive Summary

Despite the small size of the country, Swaziland is topographically and climatically very diverse. This diversity of environmental conditions supports a correspondingly high biological diversity. The primary objective of the Biodiversity Strategy and Action Plan (BSAP) is to develop a plan of action that will prevent the erosion of Swaziland's biodiversity. BSAP, as a process, does not stand alone but forms part of the Swaziland Environment Action Plan (SEAP).

Chapter 1 introduces the subject of biodiversity and its value, provides a brief summary of the BSAP process, and presents the goals of BSAP. The main socio-economic factors affecting biodiversity are also briefly discussed. There are a wide range of economic values that may be realised from the sustainable exploitation of biodiversity. This has long been recognised both locally and globally. In the Swaziland context, however, there are also a large variety of socio-cultural values attached to biodiversity.

Chapter 2 is an overview of the status of biodiversity in Swaziland by ecosystem. Four main ecosystems are recognised in Swaziland, namely montane grassland, savanna-woodland mosaic, forests and aquatic systems. The grassland and savanna ecosystems comprise 94% of the country, while the forest and aquatic ecosystems are highly restricted in distribution. The savanna ecosystem is currently best conserved (5%), while the remaining three ecosystems have only 2% of their areas formally gazetted as protected areas. Approximately a quarter of each of the terrestrial ecosystems has been converted to some other form of land-use.

The biodiversity of each of the four ecosystems is briefly described in terms of species richness, species endemism, and threatened species of flora and fauna (vertebrates). The savanna ecosystem exhibits the highest degree of species richness, but the grassland ecosystem supports the highest number of endemics. The conservation status of the four ecosystems are compared and ranked using the biodiversity criteria mentioned above together with considerations of current area protected and area converted to other use. Using these criteria, the grasslands and forests rank as the ecosystems with the highest conservation priority. This should not be viewed as evidence for the lack of conservation concern for the other two ecosystems. An analysis at this scale (i.e. ecosystem scale) overlooks fine-scale detail on the habitat scale. Certain habitats within the savanna (e.g. Lubombo Mountains) or aquatic ecosystems (e.g. montane marshes) may rate just as highly as, or even higher than, habitats within the grassland and forest ecosystems. The ecosystem analysis presented here should, therefore, be used as a broad-scale indicator, and not for decision-making at the fine-scale.

The greatest threats to these ecosystems are degradation and conversion to other forms of use. Afforestation (as a result of alien plantations) is the main land use conversion affecting the grassland ecosystem, while bush-clearing for sugar cane cultivation has impacted mostly on the savanna ecosystem. Forests and aquatic ecosystems are suffering from, *inter alia*, alien plant invasion and unsustainable resource harvesting practises. These four ecosystems provide a wide

range of biological resources which are currently being utilised by a large proportion of Swazis on Swazi Nation Land (SNL). In most cases, there are no mechanisms in place to ensure the regeneration of these resources, at least not on SNL.

Agriculture is the backbone of the economy of Swaziland with over 80% of the country's surface area currently dedicated to agriculture. Maize is the staple food of Swaziland. Although legumes are an important crop in the diet of Swazis, they are not grown to the same extent as maize. The main commercial crops grown in Swaziland are: sugar cane, cotton, citrus, pineapple, tobacco, and non-citrus fruit. Commercial forestry has resulted in the afforestation of large areas of grassland. The principle trees grown are exotic pines and gums. Cattle, goats and fowls are the main types of livestock kept. The Nguni cow is an indigenous breed which is better adapted to the environmental conditions of Swaziland than exotic breeds, and thus should be prevented from extinction through hybridisation.

Chapter 3 provides an assessment of current efforts to conserve and manage biodiversity in Swaziland. There are three main government institutions/bodies responsible for managing biodiversity in the country. These are: the Swaziland National Trust Commission (SNTC), the Swaziland Environment Authority (SEA) and the Ministry of Agriculture and Cooperatives (MOAC). In addition to these government bodies there are a number of private bodies (in particular the Big Game Parks) and NGOs which also play a role in conserving and managing the biodiversity of Swaziland. Using crude, but clearing-defined criteria, an analysis was conducted to assess the degree to which the above-mentioned institutions were contributing to the current conservation of biodiversity. It is clear from this analysis that the current institutional structure is not adequately conserving Swaziland's biodiversity. However, with only relatively small changes it may be possible to transform the current institutions to more effective ones for biodiversity conservation.

A number of laws provide protection to certain components of Swaziland's biodiversity. The Game Act of Swaziland is, if enforced, a very powerful law. The Game Act provides protection for all species of birds (except one), most of the mammals and two reptiles. The Fish Act provides some protection to fish. Other species of animals are not adequately protected by law in Swaziland. The new Flora Protection Bill provides legal protection to threatened species of plants. The Swaziland National Trust Commission (SNTC) Act and the Swaziland Environment Authority (SEA) Act are also important pieces of legislation for the conservation and management of Swaziland's biodiversity.

Swaziland has signed and ratified at least 7 International Treaties or Agreements that directly affect biodiversity conservation. These are: the Convention on Biological Diversity; the United Nations Convention to Combat Desertification; United Nations Framework Convention on Climate Change; the Lusaka Agreement; Convention on International Trade in Endangered Species of Wild Fauna and Flora; and African Convention on the Conservation of Nature and Natural Resources.

A number of *in-situ* conservation measures are currently in place. There are a total of 17 protected conservation areas in Swaziland of which six are gazetted protected areas (covering 4% of the

country's area). Most of these conservation areas are situated either in the northeast or northwest of Swaziland. In addition to these conservation areas, there are several privately-owned ranches that contain wild game but cannot be considered nature reserves or game parks at this stage. Forty-four protection worthy areas have been identified. These areas are distributed throughout Swaziland and cover all the ecosystems. Protection worthy areas have been ranked base on criteria in the following categories: biological value, physical value, socio-economic value, long-term sustainability value and availability for protection. The ranking of the protection worthy areas was based on a desktop study, and field-based studies are urgently required to corroborate these findings.

There are currently few *ex-situ* measures in place for the conservation of indigenous, non-domestic animals. There are no reputable zoos, snake parks or crocodile farms (although crocodiles are being kept in captivity by a few land-owners). A few species of large herbivores and large carnivores are kept in a semi-wild state at some of the reserves. However, there are presently no species of indigenous fauna that require *ex-situ* conservation measures. The option of *ex-situ* conservation of farm animal genetic resources is currently being pursued by the Ministry of Agriculture and Cooperatives. The local breed of cattle (Nguni) is currently being conserved *ex-situ*.

The *Ex-situ* conservation of plant genetic resources (crops and crop relatives) in Swaziland is currently being implemented by the Gene Bank (Ministry of Agriculture and Cooperatives). The *ex-situ* conservation of certain indigenous plant species is desirable. To this end, a botanical garden has seriously been proposed at Mantenga Nature Reserve, but requires support in order to ensure its development.

Chapters 4 to 9 present the strategy and action plan. The six substrategies address the protected area network, the sustainable utilisation of biological resources, the conservation of agro-biodiversity, the risk-minimisation of LMOs, the improvement of institutional, policy and legal framework, and the enhancement of public awareness and support for biodiversity conservation. Each substrategy has one goal. The six goals are:

- A viable set of representative samples of Swaziland's full range of natural ecosystems are conserved through a network of protected areas.
- Biological resources of natural ecosystems outside of the protected areas network are used sustainably.
- The genetic base of Swaziland's crops and livestock breeds is efficiently conserved.
- Risks associated with the use of living, modified organisms (LMOs) in Swaziland are minimized.
- The institutional, policy and legal frameworks, as well as the human resources needed to implement the Biodiversity Strategy and Action Plan, are developed.
- Public awareness of, and support for, biodiversity conservation is enhanced.

Associated with each of these six goals are a number of substrategies and priority actions (the latter are summarised in Annex 2).

Chapter 10 suggests a framework for the implementation of BSAP. Possible sources of funding are mentioned, as are the functions of the Steering Committee. It is stressed that BSAP is an integral part

of the SEAP process, and as such, BSAP must not be viewed in isolation. It is also suggested that, in implementing BSAP, emphasis be placed on developing projects that fall within regional Spatial Development Initiatives. Furthermore, close cooperation between BSAP and the Convention to Combat Desertification is essential as the goals of these two processes overlap extensively.

Finally, chapter 11 outlines the need for monitoring both the progress of BSAP, and the status of biodiversity in Swaziland.

# 1.0 Introduction

## 1.1 General Introduction

Swaziland, despite its small size, supports a diverse assemblage of habitats which are home to a wide range of organisms. Although the information base on Swaziland's biodiversity is still incomplete, survey work has shown that a significant portion of southern Africa's plant and animal species occur here. The eastern region of Swaziland, for example, forms part of the Maputaland Centre of Plant Diversity (one of the World's "hotspots" of floral, as well as faunal, species richness and endemism), while the western region falls within another area of global significance, the Drakensberg Escarpment Endemic Bird Area. The value of Swaziland's biodiversity has long been recognised by Swazis who make use of it on a daily basis for various reasons including: traditional medicine, food, building material, traditional attire. Traditional systems of conserving biodiversity also exist but have not been documented and are currently being eroded.

The International Convention on Biodiversity (Article 2) defines biodiversity as `the variability amongst living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part'. Put more simply, biodiversity is the variety of plants, animals and other life forms, the genetic material they contain and the ecosystems which they form. Biodiversity can be seen as three distinct components which includes:-

- ***Genetic diversity***: the genetic variations within a species, that usually results from environmental selection pressure or from genetic mutations in reproductive cells. Genetic variations can result in distinct populations within the same species, often resulting from the diversity of habitats which are occupied by a single species.

- ***Species diversity***: the variety of different species which have emerged from evolutionary processes. The processes which generate genetic variation also create species, except the magnitude of differences is larger that in the case of species. When two organisms' genetic material differs to the extent that they are unable to produce fertile off-spring, then they may be considered different species.

- ***Ecosystem diversity***: the different communities of plant and animal species that create the numerous habitats in Swaziland. The various combinations of different plant and animals species create different ecosystems as the various organisms interact with each other and the physical environment (minerals, water and climate) around them.

## 1.2 The Importance of Biodiversity to Swaziland

Biologists have long realised the immense value of global biodiversity to humanity. Putting a monetary value on biodiversity, however, is not a simple or straightforward process. However, the use of plant extracts in the manufacture of commercial medicines (and other products) has been well documented and provides insight into their potential value. A number of Swaziland's plant genetic resources have been used or been targeted by the international community. For example, certain

herbaceous plants such as *Vigna* (e.g. tinhlumayo), *Stomatanthes*, and various bulbous species are being used or tested by other African countries for commercial purposes (Braun and Dlamini 1993). Although the economic value of these Swaziland resources have not yet been quantified, a Namibian example illustrates well their potential value.

The Namibian trade in the plants *Harpagophytum procumbens* and *H. zeyheri* (devil's claw) is based on the pharmaceutical potential of their chemical extracts harpagosid, harpagid and procumbens in the treatment of rheumatism and arthritis. In 1995 Namibia exported some 234 tonnes of *Harpagophytum procumbens* and *H.zeyheri* to Germany, UK, USA, Belgium, Spain, France and Japan (Mander *et al*, 1996). The value of these genetic resources, that is, the chemical compounds found within the plants' chemistry was worth some E1.15m in export revenue to Namibia. However, these materials would be processed and resold, with prices in the USA reaching some US$18 per 100g, or US$180 per kg. The value of the stock sold in the US would be worth some US$42m or E189m for the plants traded in 1995. The genetic material contained in the harpago chemistry thus has considerable value as a trade product. The value would be further increased if the increased welfare associated with the healing benefits derived from harpago compounds was also valued.

With the large number of plant species present in Swaziland and used in traditional healing (Dlamini 1981), there may be similar opportunities to identify and trade high yielding varieties of local medicinal plants.

The services supplied by biodiversity in contributing to, and in association with, functional ecosystems, provides Swaziland society with a wide range of goods and services (Table 1.1). These services can generate a range of benefits for the Swaziland community. It is important to note that a wide range of the above services are not consumed as goods (such a medicine or fuelwood) but are services supplied to the wider community (such as pollination, erosion control and flood control). Many of these services, for example, disturbance regulation and genetic resources, will play a critical role in supplying the Swaziland community with future options. Valuing biodiversity in Swaziland is, as in any country, a considerable challenge due to the lack of appropriate data and human expertise. To date, only one biodiversity valuation study has been undertaken in Swaziland (Turpie & Albert, 1997). There is, therefore, an urgent need to ascertain the true value of these biological resources in Swaziland.

In Swaziland there is an active harvesting and trade (both local and exported) of medicinal plants. Using the results of the KwaZulu-Natal and Mpumalanga surveys (Mander *et al.*, 1997; Mander, 1998), one can make some rough estimates for Swaziland. If we assume that the visitation frequencies for the Swazi people follows a similar pattern to Mpumalanga and KwaZulu-Natal, then there may be 5.8 million consumption events of local medicinal plants a year in Swaziland. This implies that there may be as much as 219 tonnes of plant material consumed a year (excluding exports to South Africa). Using the Mpumalanga average price of plant medicines consumed (E124/kg), then the value of the medicinal plants consumed in Swaziland may be E27 million per year (based on 1997 prices). The plant and animal species traded within Swaziland thus make a significant, and increasing, contribution to the national economy.

The plants also have another value, which is the greater welfare and lives saved from the healing brought about as a result of making use of medicinal plants. Whilst there have been no local studies done on valuing welfare and life, there is no doubt that these benefits have considerable value. There is another way to look at the value of benefits, and that is by focussing on the replacement costs which society could bear in attempting to replace the service which the medicinal plant species provide.

Another example comes from the use of indigenous antelope species. In the past 20 years, game farming has replaced cattle ranching in many parts of southern Africa. This has occurred for purely economical reasons i.e. game farming is more profitable. Indigenous game (e.g. antelope such as impala and kudu) are far more suited to surviving in Africa's drier, marginal landscapes (such as Swaziland's Lowveld) than are cattle. Not only do these indigenous species survive better during droughts, which are a natural phenomenon in these areas, but they are less susceptible to diseases, require far less water and do not impact negatively on the vegetation. Cattle in these environments, in contrast, are a burden on society and the environment. The fact that game farming is potentially financially profitable, has encouraged title deed farmers to investigate this alternative option. Although, many privately-owned ranches have turned to game farming in Swaziland, this is only now happening on Swazi Nation Land.

In Swaziland rural communities rely to a great extent on the services which the ecosystems provide. These communities have limited access to outside resources and consequently the ecosystem meets most of their basic consumer goods and services. An impact study on the Maguga Dam (Turpie & Albert, 1997) estimated that the total value of aquatic and woodland ecosystem services to the households affected by inundation was between E8 110 and E19 003 per annum. However, when subtracting the mineral resources used from the above, the average annual value was E8070 per household.

Assuming that 68% of the Swaziland population is rural, and the average household size is 6 people, then there may be any many as 90 000 rural households in Swaziland. If 60% of these households are living in woodlands throughout the country, and we assume an average value of E8070 for the value derived per household in woodlands, then the total contribution of woodlands to Swaziland could be E436 million per year. This represents some 36% of the Swaziland GDP for 1996. Importantly, this amount is not incorporated into the conventional estimation of GDP, and thus represents a considerable subsidy to the economy. Without access to the services supplied by woodlands, Swaziland would need to generate an additional E436 million per year to supply basic consumer goods such as housing material, medicine, fencing, cooking energy, etc to meet the requirements of the rural communities. Ecosystems have considerable value to both rural households and to governments. Households benefit from services which are provided at little or no cost, and governments benefit by not having to supply at considerable cost, the services which ecosystems provide.

An important direct, but non-consumptive, use of ecosystems is nature-based tourism or ecotourism.

Between 1989 and 1995, over 250 000 tourists have visited Swaziland per annum. The proportion of these tourists that are nature-based tourists is unknown. Swaziland, however, is generally recognised as a country of great scenic beauty. It is likely, therefore, that a large proportion of the tourists visiting Swaziland are (at least partially) drawn by the country's biodiversity. Visitation rates to, and expenditure in, Malolotja Nature Reserve are presented as a rough approximation of the current revenue earned from nature-based tourism in the country. Approximately 7 000 people enter Malolotja Nature Reserve per annum, spending roughly E250 000.00 in park fees. If visitation rates and expenditure are similar across all of Swaziland's reserves, then tourists spend about E2 million per annum in the eight largest reserves. This is almost certainly an underestimation as fees are higher in the private reserves. Furthermore, this does not take into account the spin-off benefits of nature-tourism (e.g. money spent on handicrafts, restaurants, etc), nor does it reflect the number of jobs that are created.

Finally, too much emphasis should not be placed on monetary value of biodiversity. Swazi Culture is strongly rooted in the Kingdom's environment. Therefore a loss of biodiversity could adversely affect the perpetuation of Swazi Culture. For example, the National Hunt (*Butimba*) is a tradition which takes place once a year at an area adjoining the Hlane National Park. The *Butimba* is a traditional hunt, with great ceremonial value, which is ordered by the King and is open to all Swazis. Therefore, the extermination of antelope species from the hunting area would signal the end of this deep-rooted ceremony. Several other examples to illustrate the socio-cultural relationship between Swazis and biodiversity are presented in Table 1.1.

**Table 1.1** Some important plants and animals used in Swaziland. These a just a few selected examples. A very large number of plants and animals fit into most of the categories below. The examples provided simply illustrate this point. Further details on the value and uses of Swazi plants and plant products can be found in Dlamini (1981) and Makhubu (1978). Also included as some examples of goods and services supplied by biodiversity (Mander, 1998).

| **Category** | **Examples** |
|---|---|
| Food/drink | umganu (*Sclerocarya birrea*), umtfundvuluka (*Ximenia caffra*) |
| Fodder/grazing | sitfwetfwe (*Acacia spp*.), intunga (*Themeda triandra*) |
| Medicinal | umkhuhlu (*Trichilia emetica*), incumbe (*Boophane disticha*) |
| Timber | umphahla (*Brachylaena dicolor*), umphulumbu (*Combretum imberbe*) |
| Ornamental | umkhiwa (*Ficus sycamorus*), siphama (*Erythrina latissima*) |
| Soil/water conservation | umhlume (*Breonadia salicina*), tjani-bengadze (*Pennisetum clandestinum*) |
| Handicraft | umvangati (*Pterocarpus rotundifolia*), likhwane (*Cyperus immensus*) |
| Clothes | impunzi (*Sylvicapra grimmia*), impala (*Aepyceros melampus*) |
| Cultural rituals | lusekwane (*Dichrostachys cinerea*), umhlanga (*Phragmites spp*.) |
| Wildlife viewing | tinyoni (birds) and tinyamatane (game species) |
| Game farming | inyamatane (game species) |
| Biological control | e.g. control of insect pests by bats, or rats by snakes |

## 1.3 The Swaziland Biodiversity Strategy and Action Plan (BSAP)

### The need for BSAP

The Swazi environment is rapidly changing as a result of rapid population growth, industrialisation, urbanisation and increasing agricultural demands. Many of these changes are negatively affecting the natural environment. The Government of Swaziland responded to this challenge by initiating the development of a Swaziland Environment Action Plan (SEAP) which was completed in 1997 (Government of Swaziland, 1997). The objectives of SEAP were to:

- Provide a state-of-knowledge overview of the environmental conditions in the country.
- Identify, prioritise and where possible quantify environmental problems.
- Propose solutions to immediate environmental problems in the form of programmes and projects, and institutional and legislative reforms.
- Establish a clear indication of government's priority areas with respect to the environment so as to guide and give proper orientation to donor intervention in this field.
- Establish a framework which provides coherent direction for the process of environmental monitoring and action planning in the future.
- Provide a framework for continuous development and environmental policy dialogue within the country and with donor partners.

One of the five major programme areas identified by SEAP is the "Management and Use of Biodiversity". It is within this context that Swaziland embarked on the development of a National Biodiversity Strategy and Action Plan (BSAP). Furthermore, Swaziland signed and ratified the Convention on Biological Diversity (CBD) in 1994. By developing BSAP, Swaziland is complying with one of Her obligations to the CBD.

### Convention on Biological Diversity (CBD) guidelines and objectives

While the CBD confirms that each State is sovereign over its biological diversity, contracting parties have agreed to support the three basic objectives of the Convention which are:

- the conservation of biological diversity.
- the sustainable use of its components.
- the equitable sharing of the benefits arising out of the utilisation of genetic resources.

Furthermore, Article 6 of the Convention defines some of the key obligations of the Parties:

*Each Contracting Party shall, in accordance with its particular conditions and capabilities:*

> *a) Develop national strategies, plans or programs for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programs which shall reflect, inter alia, the measures set out in this Convention, relevant to the Contracting Party concerned; and*

*b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs and policies.*

It is clear, therefore, that the development of a National Biodiversity Strategy and Action Plan is a key obligation of each Contracting Party to the CBD. Although the Convention defines the basic objectives and principles of a strategy, it has been left to the Conference of Parties (COP) to interpret the framework of the CBD and to develop specific guidance for its application. A review of COP guidance (Hagen, undated) shows that the following elements should be incorporated into national biodiversity strategies and action plans:

- Strategies for biodiversity conservation.
- Strategies for sustainable use of biological resources.
- Strategies for equitable sharing of benefits derived from genetic resources.
- Strategies for the conservation and sustainable use of agro-biodiversity.
- Strategies for biosafety.

**Initiation of the BSAP process**
The BSAP process was initiated with the following intentions:

- To reinforce awareness of the importance of policy reform with particular reference to the conservation of biological diversity.
- To prepare the ground and identify needs for activities to be undertaken by further biodiversity conservation projects.
- To draw upon local perceptions about environmental management and to explore alternatives to resource based livelihoods.
- To integrate these local perceptions with relevant international conventions and undertakings.
- To stimulate and maintain involvement in the planning of participatory methods of conservation both *in situ* and *ex situ*.
- To help the Government of Swaziland to formulate: 1) the National Biodiversity Strategy and Action Plan; and 2) the country report to the Conference of Parties of the Convention on Biological Diversity.

**1.4 Methodology: the BSAP Process**
Swaziland ratified the Convention on Biological Diversity (CBD) in 1994. In accordance with Article 6 of the CBD, and with funding from the Global Environment Facility (GEF), Swaziland initiated the BSAP process in 1997. The Swaziland Environment Authority (SEA) is the government body responsible for the BSAP process. A Steering Committee was established to guide the development of BSAP. A National Coordinator was appointed for handling the day-to-day administration of the project. The National Coordinator was assisted by two international consultants, one regional consultant and seven local consultants (as well as a secretary and an assistant). All the SEA staff were involved in various capacities throughout the process. Finally, a participatory approach, involving all relevant sectors and levels of decision making, was used. The Biodiversity Strategy and Action Plan approach was an ecosystem approach to biodiversity

management in Swaziland. The following activities formed the basis of the BSAP process:

- Inventory of biodiversity information. Two consultants were assigned the duties of finding and synthesising the available information on Swaziland's biodiversity.
- A First National Workshop was organised with the dual function of getting input from a wide range of technical and lay persons, and of publicising the BSAP process.
- A training and familiarisation course for local consultants (this course was presented by one of the international consultants).
- Four regional workshops were conducted for sourcing ideas, mainly from local communities.
- The establishment of five task forces, with each task force being headed by a local consultant.
- A technical workshop, involving more than 50 people, to review a draft biodiversity strategy.
- A Second National Workshop at which the draft biodiversity strategy was presented and assessed.
- Two Steering Committee retreats to review the BSAP document.
- Reviewed by UNDP.
- Review and approval by the SEA Board and then by Cabinet.
- Preparation of the final report to be presented at the Conference of Parties (COP) of the CBD.

**Constraints and problems experienced**

There were a number of obstacles that hindered the development of BSAP, which are listed below:

- Coordination of the different sectors. Many people were not certain of what biodiversity really is (or how it impacts on the daily lives of most Swazis), nor were they sure of the purpose of the BSAP process. This made coordination of the different sectors difficult.
- Participation (both at Steering Committee meetings, and at the workshops) and could have been better.
- Lack of accessible data. Data on the status of Swaziland's biodiversity are incomplete (this is especially true for data on the economic value of biodiversity). Thus, decisions often had to be made in the absence of quantitative information.
- Lack of technical expertise. Technical expertise were lacking in some important or key areas such as biotechnology and resource economics.

On the positive side, though, the BSAP process did tap the expertise and experience of a wide range of Swazi Society, and almost all local biodiversity "experts" were involved at some stage.

**Documents arising from the BSAP process**

The primary outcome of BSAP, to date, is the present document. As mentioned in the SEAP document, however, the process of developing a strategy is valuable in itself, independently of the final document. Other documents compiled during the BSAP process include: eight consultancy reports (seven by local consultants and one by a regional consultant), two reports by the international consultant, a first report to COP, reports from the two national workshops, the four regional

workshops and the technical workshop and a concept note to the GEF (through the World Bank). The following reports were developed as part of the BSAP (or SEAP) process and were valuable sources of information. The figures in brackets indicate the sections of the present document to which the reports pertain (all the reports contributed to the development of the strategy, section 5.0):

- Swaziland Biodiversity Working Group (SEAP). 1996. Issues pertaining to the conservation and sustainable use of biological diversity.
- Government of Swaziland. 1997. Swaziland Environment Action Plan. Vol. I & II.
- Monadjem, A. 1997b. A survey of information on the zoological biodiversity in Swaziland.
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- Mahlaba, T.A.M. 1998. Swaziland National Biodiversity Database.
- Sithole, V.M. 1998. Marketing and finance of nature-based tourism.
- Khumalo, K.P. 1998. Sociological perspectives on biodiversity in Swaziland.
- Masina, G.T. 1998. Institutional framework and community conservation of biodiversity in Swaziland.
- Earnshaw, D.M. 1998. Commercial biological resources/genetic wealth in Swaziland.
- Mander, M. 1998. The value and commercialisation potential of biodiversity in Swaziland: a preliminary discussion.

### 1.5 The Goals of Swaziland's BSAP

**Principal objectives**

The principal objectives of the Swaziland Biodiversity Strategy and Action Plan have been adopted from the Convention on Biological Diversity and are:

1. To conserve the biodiversity of Swaziland.
2. To encourage the sustainable use of biodiversity in Swaziland.
3. To ensure that benefits accrued from the utilisation of Swaziland's biodiversity are shared equitably.

**Basic principles**

The following basic principles have been adopted by the Steering Committee to guide the implementation of the Swaziland Biodiversity Strategy and Action Plan.

1. *The components of the biodiversity of Swaziland should continue to be identified, monitored and researched for the purposes of conservation, education, sustainable use, commercial use and leisure.* Currently, very little is known about Swaziland's biodiversity. Species lists (and even distribution maps) exist for some groups of animals and plants, but large gaps remain in our knowledge. These gaps can only be filled by survey work and research. Since biological systems are prone to change, survey work should be conducted on a continuous basis. The results of these efforts may be used for conservation purposes (eg. in providing information on the distribution and abundance of an endangered species), education (eg. informing the public about Swaziland's biodiversity), sustainable use (eg. by providing information on

sustainable harvesting rates), commercial use (eg. by identifying organisms with medicinal value), and leisure (eg. by the publication of books and other articles on the natural history of Swaziland).

2. *The close link between the traditional Swazi way of life and biodiversity needs to be recognised and promoted in line with conservation principles.* Swazi Tradition is firmly rooted in the Swazi environment. Biodiversity plays a central role in Swazi Culture and because of this, there are many traditional laws and beliefs which prohibit non-sustainable practices. Many of these traditional beliefs have recently fallen away and/or are being ignored. The traditional beliefs that contribute to the conservation of Swaziland's biodiversity should be recognised and re-instilled into the people of Swaziland.

3. *Participation and involvement at all levels is necessary for the conservation of biodiversity in Swaziland.* All stakeholders should be involved in the decision-making process in matters concerning the management and utilisation of biological resources.

4. *Benefits derived from technological advances based on the use of indigenous knowledge and genetic resources should be shared equitably.* Certain industries manufacture goods derived from biological resources and indigenous knowledge systems. In these situations, profits must be shared fairly between the industry manufacturing the goods and the community from which the biological resource (or indigenous knowledge) was acquired.

5. *Biodiversity is best conserved in-situ (both within and outside of protected areas), but where necessary ex-situ methods should be developed to support in-situ efforts.* Due to the enormous variation present in biological systems, where possible, biodiversity should be conserved in the wild (*in-situ*). In cases, however, where a particular component of biodiversity cannot be conserved in the wild, efforts should be made to conserve it in captivity (*ex-situ*).

6. *Threats to biodiversity should be addressed through an appropriate multi-disciplinary forum.* Biodiversity affects, and is affected by, a large cross-section of society. Cooperation between these various sectors is essential for managing the threats to biodiversity. A multi-disciplinary approach will ensure that these diverse (and often isolated) sectors are brought together.

7. *Access to genetic resources rests with the State.* Access to genetic resources within Swaziland should be controlled by the Government.

**Goals of BSAP**

The following goals address the strategies identified by COP and the Steering Committee as critical to Swaziland's BSAP (see section 1.3 above). The first four represent core goals, while the last two are cross-cutting goals necessary to achieve the preceding goals.

Core goals:

1. A viable set of representative samples of Swaziland's full range of natural ecosystems are conserved through a network of protected areas.
2. Biological resources of natural ecosystems outside of the protected areas network are used sustainably.
3. The genetic base of Swaziland's crops and livestock breeds is efficiently conserved.
4. Risks associated with the use of living, modified organisms (LMOs) in Swaziland are minimized.

Cross-cutting goals:

5. The institutional, policy and legal frameworks, as well as the human resources needed to implement the Biodiversity Strategy and Action Plan, are developed.
6. Public awareness of, and support for, biodiversity conservation in Swaziland is enhanced.

These goals, together with the associated objectives and priority actions are detailed in chapters 4 to 9, below.

**1.6 Socio-economic Factors Affecting the Biodiversity of Swaziland**

The implications of socio-economic factors for the Swazi environment have been thoroughly reviewed in SEAP (Government of Swaziland, 1997). Socio-economic factors pertinent to biodiversity have been summarised here. Swaziland is a member of the Southern African Development Community (SADC). The country accounts for less than a half of a per cent of the 166 million people living in the region, and it is ranked fifth in terms of gross national product (GNP) per capita. The World Bank provides basic indicators of all countries in the world and for some twelve SADC states the following indicators have been estimated (see Table 1.3).

By the standards of most of its neighbours, Swaziland has achieved a remarkable degree of economic development since gaining independence in 1968. This has occurred against a background of a rapidly rising human population. While Swaziland appears to be relatively prosperous, in the absence of major commercial mineral reserves it is dependent upon agriculture for its medium to long term growth. Most of the economic indicators for Swaziland do not show this very well. For example a typical data set for Swaziland published by the Economic Intelligence Unit (EIU) is presented in Table 1.4. The gross domestic product (GDP) is shown to have grown during the five years 1990 to 1994 with real GDP growth being the highest in 1990. This was a consequence of the substantial inward investment which took place due to economic sanctions imposed against the apartheid regime in South Africa. However, as South Africa moved towards democracy investment into Swaziland was cut back.

Further examination of Table 1.4 shows the country's competitiveness and earning power weakened against an increased population. Apparently, agriculture's contribution to GDP was 15% in 1992 and the share of exports in GDP was 77%. These figures understate the contribution of agriculture to the Swazi economy. For example, agriculture contributed just over 11% to GDP in 1993, compared to 42% contributed by industry, which itself is comprised predominantly of manufacturing and specifically by value-adding food industries, with sugar being the main raw commodity (Table 1.5).

Thus while agriculture in general is the cornerstone of the economy, sugar and citrus production are the real money earners. However, an important point to appreciate is that these high earning sub-sectors are dependent upon well managed and controlled land and water resources, centred on agricultural estates, located on Title Deed Land (TDL). In addition these estates only provide direct employment to a little over 20,000 people, or some 3% of the rural based population. Notwithstanding this, approximately 570,000 people are currently resigned to eking out a direct income from the traditional Swazi Nation Land (SNL) area. With population rising at an alarming rate, the pressure on the highly fragile land resource is likely to defeat attempts to maintain the status quo.

Another major draw-back to the existing structure of these export based agro-industrial activities is that they are predominantly financed by foreign capital. This means that the profits emanating from the activities are to a great extent repatriated off-shore. In consequence there is likely to be a move in the coming years to reduce this foreign control of the country's productive base as more Swazis became involved in the high earning sectors of the economy.

Since 1990, gross domestic savings have dropped sharply, initially due to declining foreign investment and increased consumption. An increase in the size of the civil service and salary increases have contributed significantly to increased government consumption, and a consequent decline in gross domestic savings. Presently government expenditure is approximately 49% of the GDP. This is considered too high in the face of the slowdown in investment and reduced tax revenue.

Government expenditure considerably exceeds revenues. In 1992-93, there was a budget surplus of E21 million. In 1996-97, there was a deficit of E136 million, which is expected to grow to approximately E600 million within the next four years. The renegotiation of the SACU agreement within the next ten years, when Swaziland's share of the customs revenue pool may be reduced, will put extra pressure on the budget and balance of payments positions.

Economic growth declined from an average of 4% in 1989-95 (in which the rate swung widely from 1 to 10%) to 2.7% in 1997-98, which is less than population growth rate (3.4%). This means that on the average, GDP per capita is decreasing and people are getting poorer. The 1993 Human Development Report classified 46% of the population as living in "absolute poverty".

About 25% of the population between the ages of 15 and 65 is formally employed (two thirds in the private sector and one third in the public sector). The rate of unemployment has been increasing rapidly (approximately 10% per annum), and formal employment opportunities are static or

decreasing. Distribution of income, estimated at $1,100 per capita in the Poverty Assessment Report, is highly skewed, and human development is lagging behind economic growth.

**Table 1.3** Basic economic and social indicators of twelve SADC countries, from SEAP.

| | Popn Mid 1992 | Annual Popn Growth Rate (%) 1985-92 | GPN per Capita (US$ 1992 | Adult Illiteracy Total % | Annual % Growth of GNP '85-92 | Agric as % of GDP 1992 | Share of Export in GDP (%) 1992 |
|---|---|---|---|---|---|---|---|
| Angola | 9.7 | 2.9 | .. | 58 | .. | 13 | 43 |
| Botwana | 1.4 | 3.4 | 2790 | 26 | 8.1 | 5 | .. |
| Lesotho | 1.9 | 2.7 | 590 | 20-39 | 0.8 | 11 | 19 |
| Malawi | 9.1 | 3.4 | 210 | 40-59 | -0.3 | 28 | 24 |
| Mauritius | 1.1 | 1.1 | 2700 | .. | 6.3 | 11 | 64 |
| Mozambique | 16.6 | 2.7 | 60 | 67 | -1.3 | 64 | 47 |
| Namibia | 1.5 | 3.1 | 1610 | .. | 1.1 | 10 | 14 |
| South Africa | 39.8 | 2.4 | 2670 | .. | -1.3 | 5 | 25 |
| Swaziland | 0.9 | 3.4 | 1080 | .. | 6.4 | 15 | 77 |
| Tanzania | 26 | 3.0 | 110 | .. | 1.4 | 62 | 36 |
| Zambia | 8.6 | 3.5 | 290 | 27 | -2.1 | 9 | 26 |
| Zimbabwe | 19.4 | 3.6 | 570 | 33 | -0.6 | 20 | 22 |

**Table 1.4** Economic indicators for Swaziland 1990-94, from SEAP.

| **Economic Indicators** | **1990** | **1991** | **1992** | **1993** | **1994** |
|---|---|---|---|---|---|
| GDP at market prices Em | 2297 | 2460 | 2755 | 3061 | 3507 |
| Real GDP growth % | 7.9 | 0.1 | 1.4 | 2.5 | 3.0 |
| Consumer price inflation | 12.8 | 11.2 | 9.3 | 12.9 | 14.3 |
| Population m | 0.79 | 0.81 | 0.83 | 0.85 | 0.88 |
| Exports fob $ m | 557 | 611 | 664 | 722 | 797 |
| Imports fob $ m | 587 | 632 | 765 | 771 | 827 |
| Current account $ m | 49 | 28 | 22 | 4 | 24 |
| Reserves exc. Gold $ m | 205 | 221 | 319 | 244 | 238 |
| Total external debt $ m | 225 | 213 | 208 | 211 | 198 |
| External debt-service ratio % | 5.7 | 3.0 | 2.5 | 2.6 | 3.0 |
| Sugar production (‘000 tons) | 496 | 490 | 496 | 457 | 487 |
| Exchange rate (av) E: US$ | 2.587 | 2.761 | 2.852 | 3.268 | 3.551 |

**Table 1.5** Origins of GDP 1993, from SEAP.

| Origins of GDP 1993 | % of Total |
|---|---|
| Agriculture | 11.3 |
| Industry | 41.6 |
| (Contributed by manufacturing) | (36.5) |
| Services | 47.2 |
| GDP at factor cost | 100 |

**Population growth**
The last census report (1998) stated a population rate of 2.7% per annum. Currently, the estimated population in Swaziland is 995 000. Of the total population, 47% is composed of people under 15 years old. This means a high dependancy ratio. In addition, this skewed structure indicates high population growth rates continuing well into the future. Household sizes are also expected to increase, and the costs of social services and infrastructure will be increasingly borne by a smaller group than the direct user group.

Currently 25% of the population live in urban or peri-urban areas; 69% live on Swazi Nation Land; and roughly 6% individual tenure farms. Rural to urban migration is occurring at the fairly high rate of between 3-5%, and it is expected that by the year 2030, approximately 70% of the total population will be living in urban or peri-urban areas. Presently, this is roughly the same percentage of the existing rural population, consisting of about 88,000 households more than a third of them headed by women.

The real dilemma facing Swaziland at the current time is how to involve the rural poor in sustainable, productive activities which help reduce poverty, expand incomes and promote long term development against a rising population base. Under-pinning this is the need to promote actions in the Swazi Nation which emanate from an awareness of environmental sustainability, essential to maintain and improve the productivity of existing SNL and TDL areas.

**Culture and traditions**
In Swaziland, there exists a dualistic system of traditional and modern lifestyle which permeates all forms of economic, social and political interactions. The importance of traditional practices and customs provides cohesiveness and a strong sense of cultural identity. On the other hand, some traditional practices are not "environmentally-friendly". For example, the practice of investing in cattle results in overgrazing and consequent erosion. The traditional dispersed settlement patterns make the cost of provision of social and economic infrastructure and related services, prohibitive.

**Women and the environment**
In Swaziland women are responsible for approximately a third of all rural households and they are the main users of natural resources especially wood lots, grasses and wild fruits. Yet, women contribute very little towards the management of these resources.

Various community based indigenous social and religious groups have sought to improve the status of women as early as 1940. However, these efforts concentrated on addressing the special needs of women. Since 1991, both NGO and government efforts have been concentrating more on creating a gender equitable economy as a basis for national development.

The National Steering Committee of Women's affairs (NSCOWA), now the Swaziland Committee on Gender and Women's Affairs (SCOGWA), was launched in 1994 as the main technical co-ordinating body for the development of the gender programme. It has been working with the NDS Gender Sector Committee (GSC) to ensure the following: (i) integration of gender in the NDS; (ii)

formulation of a woman's policy; (iii) creation of an infrastructure for coordination of gender and development activities; and (iv) development of a long-term implementation strategy. In addition a Gender Task Force has been appointed by the Prime Minister to develop a Gender Policy for the country. This task is under the Economic and Social Reform Agenda (ESRA), and scheduled to be completed by the end of 1997. In line with the African Platform for Action (APA) and the Global Platform for Action (GPA), Swaziland has identified critical areas of concern which are inter-related and collectively perpetuate the cycle of disadvantage and disparity between females and males. Those which have special implications for women participating in environmental management are (a) participation in decision-making; (b) feminisation of poverty; (c) reproductive health; (d) education; (e) economic empowerment; and (f) natural resource management.

**Property rights**

By property rights is meant " ....all these rights, both personal and real, which confer on the holders inalienable and exclusive entitlement to them...". This means that property rights relate not only to land and houses, cars, machinery, or merchandise, but also to rental agreements, foreign currency certificates, and their free convertibility, and all sorts of credits..." (De Soto, 1990. P. 159).

One premise of this action plan is that clearly defined, enforceable and transferable property rights are fundamental to efficient market activity, and are therefore required for economic and social empowerment, and for application of the principle of free market environmentalism. Property rights can engender clarity and accountability: Mismanagement is seen as an inevitable result of the lack of such qualities. In short, if no one person is ultimately accountable for a resource, no-one is. For example, a significant proportion of environmental degradation can be seen as a process of dumping pollutants from areas where property rights are more clearly defined and enforced to those where such rights are less so (such as in public domain - air, water, communal lands, untended private lands). For reduction of poverty in both economic and environmental terms, a fundamental strategy is to deliver such property rights into the hands of as many citizens as possible.

**Policy**
Since Independence (1968), Swaziland has been developing National Development Plans with guiding policies and strategies for all socio-economic activities. The main national goals have been economic growth, sustainable development, self-reliance, equity and participation and social justice and stability. Late in 1996, a special incentive, the Economic and Social Recovery Agenda was developed for a two-year period. This policy document has identified the environment as one of its main areas of focus. Priority was given to the completion of the Swaziland Environment Action Plan (SEAP) and to several conservation initiatives.

**Present land use**
Reliable information on the present land use is a prerequisite for the planning and implementation of programmes related to land and environment. Spatial and tabular land use information is available for Swaziland with the following main categories distinguished: crop agriculture, animal husbandry, forestry, extraction and collection, nature protection, settlement and industry, and land not used. Several of these land uses are found in complex patterns, such as small-scale traditional farming in close association with communal grazing. Often there is a primary and secondary use of the same land, e.g. extraction and collection takes place in savannas and woodlands where animal husbandry is the primary use. The primary use of national parks is nature protection, but recreation is an important secondary use.

Table 1.6 gives an overview of the present main land uses in Swaziland based on the inventory available at a scale of 1:250,000 (Remmelzwaal and Dlamini, 1994). These categories are the most relevant subdivisions of the major land uses mentioned above. The large-scale commercial crop agriculture can be subdivided into the following: rainfed field cropping (92.0%, mainly cotton and pineapple), irrigated field cropping (3.7%, of which 3.5% sugarcane) and irrigated tree cropping (0.3%, mainly citrus).

The above figures are gross figures. Substantial reductions have to be applied to arrive at net percentages. For instance, about one third of the area occupied by subsistence cropping is used for grass strips and infrastructure, hence the estimated net percentage is 9. Part of the extensive communal grazing area is actually not utilized for grazing because of steep slopes and dense woodlands, hence an estimated net percentage of 42.

**Land tenure**
Land tenure arrangement plays an extremely important role in the management of land and biodiversity. The history of land tenure arrangements in Swaziland is very complex (Funnell, 1991). There are three main categories of land tenure:

- Swazi Nation Land (SNL)
- Crown Land
- Private Freehold or title Deed Land (TDL)

There is in fact a fourth category of Concession Land, which is minor (refer to the Land Partition Act. 1907). Swazi Nation Land is held in Trust by the King for the Swazi Nation. Crown Land is land over which Government holds title. Table 1.7 gives an overview of the main tenure categories based on a national inventory (Remmelzwaal and Vilakati, 1994). Title Deed Land is subdivided into rural and urban. Swazi Nation Land is subdivided into SNL *sensu stricto*, comprising all the land that was SNL at Independence, and SNL purchased, comprising all freehold land purchased after Independence and returned to SNL status. There is still, however, a title on purchased SNL. The subdivision of SNL is made on the basis of the control over the land.

The results of Table 1.7 can be summarized as follows. The total of TDL amounts to about 25 %, and the total of SNL to about 74 %. Of the combined total of SNL approximately 75% is controlled by Chiefs, 9% by MOAC, 4% by Tibiyo, 3% by SNTC and the remaining 9% is leased.

It is to be noted that although Table 1.7 presents the best figures available, recent investigations suggest that the percentage of Crown Land may be significantly higher than the 0.4% given.

**Role of biodiversity in the national economy**

The full economic value of Swaziland's biodiversity has yet to be determined. However, indications are that its value is considerable. A recent review of the non-timber forestry sub-sector in Swaziland concluded that the economic value of annual consumption of four chosen product groups (foods and drinks, household items, medicinal plants and fuelwood) is estimated at between E129 million and E514 million (Olsen, 1999). The GDP for 1999 was E7 612 million (Central Bank of Swaziland, 2000) indicating that these few biodiversity goods can contribute up to 7% of GDP. These estimates were considered an absolute minimum value of non-timber forestry products as many product groups were excluded from the analyses and valuation was done using methods assigning a low value to products (Olsen, 1999). Furthermore, it must be borne in mind that non-timber forestry products make up only a small fraction of the overall utilisation of biodiversity (excluded products include, amongst many others, grazing lands, rivers and wetlands).

**Table 1.6** Main land uses in Swaziland, from SEAP.

| Code | Groupings of main land uses | $km^2$ | % |
|---|---|---|---|
| SA | Small-scale subsistence crop agriculture (rainfed annual field cropping) | 2140 | 12.3 |
| LA | Large-scale commercial crop agriculture (irrigated and rainfed field/tree cropping) | 1040 | 6.0 |
| CH | Extensive communal grazing | 8670 | 50.0 |
| RH | Ranching | 3320 | 19.1 |
| F | Plantation Forestry | 1400 | 8.1 |
| P | Parks, Wildlife management | 670 | 3.9 |
| S | Residential, Industry, Recreation | 80 | 0.5 |
| W | Water Reservoirs | 40 | 0.2 |
| Total | | 17360 | 100 |

**Table 1.7** Land Tenure Types in Swaziland, from SEAP.

| CODE | LAND TENURE TYPE | $KM^2$ | % |
|---|---|---|---|
| **SS** | **Swazi Nation Land, *sensu stricto*** | | |
| | - Controlled by chiefs, communal | 8470 | 48.8 |
| | - Controlled by chiefs, non-communal | 140 | 0.8 |
| | - Controlled by Tibiyo | 80 | 0.5 |
| | - Leased to companies or individuals | 140 | 0.8 |
| | *Subtotal* | *8830* | *50.9* |
| **SP** | **Swazi Nation Land, purchased** | | |
| | - Controlled by chiefs, communal | 1010 | 5.8 |
| | - Controlled by Tibiyo | 420 | 2.4 |
| | - Controlled by National Trust Commission | 460 | 2.6 |
| | - Lease to companies or individuals | 980 | 5.7 |
| | - Controlled by Ministry of Agriculture | 1180 | 6.8 |
| | *Subtotal* | *4050* | *23.3* |
| **TU** | **Title Deed land, urban area** | 130 | 0.7 |
| **TR** | **Title Deed Land, rural area** | 4240 | 24.4 |
| **CL** | **Crown Land** | 70 | 0.4 |
| | **Water Reservoirs** | 40 | 0.2 |

| | | | |
|---|---|---|---|
| | **Total** | 17360 | 100 |

# 2.0 The Status of Biological Diversity in Swaziland

## 2.1 The Classification System Adopted

Swaziland recognises the importance of taking an ecosystem approach for the successful conservation of its biodiversity. The following four ecosystems are recognised in Swaziland (see Figure 2.1):1) Montane grasslands2) Savanna-woodland mosaic3) Forests4) Aquatic systems (including rivers, streams, wetlands, marshes)The justification for these four ecosystems is as follows. An ecosystem comprises a distinct biological community together with (and often shaped by) its associated physical environment. An ecosystem is, therefore, a functional unit which is distinct from other ecosystems in both its species composition and the ecological processes driving that ecosystem.Seven biomes, defined by similar criteria to that stated above, have been recognised in southern Africa (Rutherford & Westfall, 1994) and are: grassland, savanna, forest, nama karoo, succulent karoo, fynbos and desert. The first three biomes occur in Swaziland and are recognised as functional ecosystems. The grassland, savanna and forest ecosystems are, however, all terrestrial systems. Aquatic systems are driven by very different forces and, therefore, a separate aquatic ecosystem is also recognised.

The montane grasslands (more or less restricted to the highveld and the highest parts of the middleveld) occur in western parts of Swaziland and for the most part comprise a distinct flora and fauna. The savannas and woodlands, although separated into several middleveld and lowveld physiographic zones, are faunistically uniform and are driven by the same forces of fire and herbivory. It has been shown that the variation in species composition of mammals, frogs and birds is insignificant within the savanna zone, but is distinct from that of the montane grasslands. This strengthens the argument for separating the savanna-woodland ecosystem from the grassland ecosystem. It also argues for recognising only a single savanna-woodland ecosystem, rathering than attempting to subdivide it into further vegetation units which do not represent distinct functional ecological units.Forests are restricted to a few (dwindling) patches located mostly in the west and the Lubombo Mountains in the east. Although species composition varies somewhat between forests in these two zones they are recognised as being part of the same ecosystem because the basic ecological functioning of these two forests is similar. The aquatic ecosystem consists of rivers, streams, marshes and other wetlands which are inundated for a significant part of the year.

There are two distinct advantages to using the proposed classification system:1) It follows the classification system in place for southern Africa and therefore allows a comparison of the ecosystems found in Swaziland with ecosystems in neighbouring states.2) There is now considerable evidence (obtained from recent studies of vertebrates) that these ecosystems are reflected by changes in their faunal assemblages. This adds to the plausibility of these ecosystems being functioning ecological units rather than simple descriptions of the vegetation.The four ecosystems as defined here also correspond with the physiographic zones of Sweet and Khumalo (1994) which are mostly been based on geography, grazing resources for cattle and vegetation types (none of which necessarily define functional ecological units); as well as the veld types of I'Ons (1967), Acocks

(1988) and Low & Rebelo (1998). The montane grasslands correspond to the highveld, while the savanna-woodland mosaic corresponds to the middleveld, lowveld and Lubombos. The forest and aquatic ecosystems are interspersed throughout the four physiographic zones. Low & Rebelo recognise seven biomes, of which their forest, grassland and savanna biomes correspond with the forest, savanna-woodland mosaic and montane grassland ecosystems as presented here.

**2.2 Biodiversity Description of Ecosystems**

Swaziland lies between latitudes 25 and 28 degrees south and 31 and 32 degrees east in the south-eastern part of Africa. The country is landlocked and covers an area of 17 364 $km^2$. It is bounded by South Africa in the north, west and south, and by Mozambique in the east. Although Swaziland is small in size, it has great variation in landscape, geology and climate.

Swaziland is located between the South African plateau (reaching over 1500 metres) and the coastal plains of Mozambique. Thus the western part of the country lies in escarpment area, and the eastern part in the zone of the coastal plains. Separating the Swaziland coastal plains from the Mozambique coastal plains, is the Lubombo Mountain Range.

Despites her small size, Swaziland supports a rich and varied biodiversity. Over 820 species of vertebrates have been recorded here (Clay, 1976; Hyslop, 1994; Boycott, 1992a; Parker, 1994; Monadjem, 1997b, 1998a). Although the country's higher plants have been collected and studied since the 1950s (Compton, 1966, 1976; Kemp, 1983), the distributions of most species are poorly known and new records are constantly being added. To date, at least 2418 species of plants have been recorded within Swaziland (L. Dobson, in lit.), but this figure may well rise to over 3000 species with additional field work. In addition to harbouring a high species richness, Swaziland also supports 18 endemic species of plants and one endemic vertebrate (at present, invertebrates of Swaziland are too poorly known to be included in the analysis). Considering the country's small size, these figures suggest that Swaziland's biodiversity is of global significant.

The savanna and grassland ecosystems cover 48% and 46% of Swaziland, respectively, while the forest and aquatic ecosystems cover the remaining 6% (refer to Table 2.1, and see Figure 2.1 for distributions of these ecosystems). What follows is an assessment of the biodiversity of each ecosystem (as defined in section 2.1 above). It is important to bear in mind that the distributions of most species are poorly known in Swaziland. The findings presented here must, therefore, be accepted as preliminary, to be revisted at such time when sufficient data are available. Included in the assessment are the biological resources available in each ecosystem as well as the threats to each ecosystem. In order to make a meaningful assessment, only the predominant resources and threats are listed. An exhaustive list of the resources available and the threats to them would be very extensive but would contribute little to this exercise.

**Montane grasslands**

The grassland ecosystem occurs in the west of Swaziland, generally at elevations above 1000m. A dominant feature of this ecosystem is its treeless nature which is determined by climate and fire. Numerous woody species, however, do occur in fire-excluded areas such as rock outcrops. A large number of plant and animal species are restricted to this ecosystem (on a southern African scale).

Although the grassland ecosystem is extensive, and floristically very diverse, only 1.1% of its area is currently conserved in southern Africa. This underscores the conservation importance of this ecosystem at a regional scale.

Within Swaziland the grassland ecosystem covers an area of 7990 $km^2$ or 46% of the nation (refer to Table 2.1). Currently, only 2% of this ecosystem is conserved in Swaziland, while a significant portion (25%) has been converted to other forms of land use (predominantly plantation forestry and to a lesser extent urban development). Most of this conversion took place before 1985 (refer to Table 2.1). An additional 526 $km^2$ (7% of the grassland ecosystem) has been proposed as protection worthy, but at present does not enjoy any form of protection.

The grassland ecosystem supports a large diversity of fauna and flora (refer to Table 2.2). In fact, this is the richest ecosystem in terms of plant species, and the second richest in terms of vertebrate species. Many of these species are restricted to the grassland ecosystem, but do not qualify as national endemics as they also occur in neighbouring South Africa. However, 13 species of endemic plants and the only endemic vertebrate (the lizard *Afroedura major*) occur in the grassland ecosystem. (This lizard does not actually live in grassland habitats; it occurs in rocky outcrops along rivers and hence survives in granite islands within the grassland ecosystem). Hence, over 70% of Swaziland's known endemics are restricted to the grassland ecosystem. The grassland ecosystem also supports a significant portion of the threatened flora and fauna of Swaziland (refer to Table 2.2). Numerous species of animals are restricted to this ecosystem (but also occur in neighbouring South Africa, and therefore are not national endemics, but could be viewed as regional endemics) including the birds: *Oenanthe bifasciata, Geocolaptes olivaceus* and *Macronyx capensis*; the mammals: *Pelea capreolus, Otomys irroratus* and *Amblysomus hottentotus*; the reptiles: *Chamaesaura aenea, Lygodactylus ocellatus* and *Lamprophis swazicus*.

Typical grass species include *Themeda triandra, Hyparrhenia hirta, Diheteropogon amplectans* and *Loudetia simplex*. A large variety of forbs and herbs also occurs. Fire plays an important role in this ecosystem and changes in the fire regime can dramatically alter the vegetation, in turn affecting the fauna. Studies (mostly conducted in South Africa) have shown that the highest species diversity is observable in grasslands which are burnt on a 2-4 year cycle (Rowe-Rowe & Lowry, 1981). Grasslands burnt more or less frequently rapidly decline in species richness. This is compounded by the effect of overgrazing which also serves to reduce species richness (Bowland & Perrin, 1989). Much of the variation in habitat quality in the grassland ecosystem is explicable in terms of these two factors. However, geology and soil type also influence habitat structure in this ecosystem. For example, grassland in rocky outcrops (which are common in parts of the grassland ecosystem) provides suitable conditions for many plants and animals not found elsewhere (e.g. *Oenanthe bifasciata, Leucospermum gerrardii* and *Protea parvula*). Furthermore, the grasslands in the north are recognised as distinct from those in the south (Acocks, 1988) and they support a slightly different avian community (Parker, 1994).

The predominant biological resources currently utilised or potentially available from this ecosystem are livestock fodder, natural medicine and food, and wildlife (Table 2.3). The magnitude to which

each of these biological resources has been, or currently is being, utilised varies extensively depending on land use. In protected areas exploitation of biological resources is either part of the management strategy (e.g. culling) or is due poaching. On SNL, however, biological resources are used extensively and it is not unusual for families or communities to depend on them for their livelihood. Hence, wildlife resources (especially antelopes and their mammalian predators) have been decimated in this ecosystem. With the exception of protected areas (covering a mere 2%) and afforested areas almost the entire grassland ecosystem is utilised for livestock grazing. On SNL, grazing pressure can be enormous and there are no mechanisms in place to prevent over-grazing. Fauna and flora are utilised both for the preparation of natural medicine and for food. This has lead to the destruction of wildlife (as outlined above), and is now contributing to the demise of medicinal plants. There is currently no mechanism in place to ensure the regeneration of what is being harvested. There appears to be an increase in the harvesting of medicinal plants, but this trade has not been quantified. Two other major threats to the grassland ecosystem are the continued clearing of grassland for cultivation of rain-fed crops, and afforestation with exotic plantations. The rate of afforestation has declined in the past two decades (see Table 2.1), while the rate of clearing for cultivation of crops has increased. The detrimental effects of the injudicious use of fire must not be overlooked. On SNL, Grasslands typically are burnt annually in the dry season. This results in a flush of green grass at a time when the food supply of livestock is low. However, as mentioned above, annual burning has been shown to reduce biodiversity of grasslands. Lastly, the impact of alien invasive plants can be observed over much of this ecosystem, though it tends to be patchy in distribution. Amongst the worse invaders is the black wattle which is spreading at an alarming rate.

**Savanna-woodland mosaic**

The savanna ecosystem is the most extensive in southern Africa (comprising 34% of the area of South Africa). The characteristic feature of the savanna ecosystem is the co-existence of grasses and trees. The amount of tree cover can vary widely from a few scattered trees (open savanna) to 75% canopy cover (closed woodland). On a regional scale, the savanna ecosystem has the best conservation status (with over 8% of the area conserved in South Africa).

This ecosystem occurs in the central, eastern and northern parts of Swaziland, covering 8327 $km^2$ or 48% of the country (refer to Table 2.1). Nationally, 5% of this ecosystem falls within formally protected areas, and a further 2% is currently managed for wildlife conservation. A quarter of this ecosystem has been converted to some other form of land use (predominantly for cultivation of sugar cane).

The savanna ecosystem is very rich in species, supporting a similar number of plant species to the grassland ecosystem, but almost double the number of vertebrate species (refer to Table 2.2). However, only two endemic plants and no known nationally endemic animals are found here (refer Table 2.2). But these figures do not accurately reflect the true biological value of the savanna ecosystem. For example, the savanna ecosystem covers a large part the Lubombo Mountains. Within this ecosystem, there are 7 species of plants (e.g. *Encephalartos lebomboensis, Euphorbia keithii* and *Aloe keithii)* and 3 species of vertebrates (*Platysaurus lebomboensis, Leptotyphlops telloi* and *Cordylus warreni*) that are endemic to the greater Lubombo mountain range (including South Africa and Mozambique). This uniqueness of the Lubombo Mountains is lost in the current analysis which

is bound by political (and not ecological) boundaries. In terms of conservation status, 71 species of threatened plants occur here compared with 161 and 53 species in the grassland and forest ecosystems, respectively. The savanna ecosystem, therefore, is highly diverse, but endemism is low and relatively few species (with the exception of large mammals such as antelopes and their predators) are threatened. From a resource utility perspective, however, 66% of the commonly used plant species occur here (refer Table 2.2).

The savanna ecosystem occurs over a range of altitudes between 100 - 900 m. The specific type of savanna vegetation present at a site depends on geography, soils, impact of herbivores and fire, as well as human impact. The highest altitudes occur in the west (adjacent to the grassland ecosystem), dropping gradually to the lowest altitudes in east, but rising again in the far east as a result of the Lubombo Mountains. At higher altitudes (500 - 900 m), the vegetation is characterised by tall grassveld with scattered trees and is generally located on steep slopes or rolling hills. Typical grasses include *Hyparrhenia hirta, Hyperthelia dissoluta, Heteropogon contortus, Cymbopogon excavatus, Panicum maximum* and *Themeda triandra.* Typical trees and shrubs include *Acacia spp., Sclerocarya birrea, Vangueria infausta, Syzygium cordatum, Canthium spp., Gymnosporia buxifolia, Dichrostachys cinerea, Rhus spp., Pterocarpus angolensis, Lannea discolor, Annona senegalensis, Combretum spp., Faurea rochetiana, Euclea spp.* and *Bauhinia galpinii*. At altitudes between 250 - 500 m, the savanna ecosystem is typically broadleaved woodland on steep to gentle slopes. Typical trees and shrubs are similar to the higher altitude savannas but also include include *Ficus sycomorus, Peltophorum africanum, Albizia versicolor, Terminalia sericea, Grewia spp., Gymnosporia senegalensis, Ziziphus mucronata, Trichilia emetica* and *Lonchocarpus capassa*. At the lowest altitudes (100 - 300 m), the savanna ecosystem is located on basaltic plains and typically supports an *Acacia* woodland. Typical grasses include *Panicum maximum, Themeda triandra, Eragrostis spp., Bothriochloa insculpta, Cenchrus ciliaris, Digitaria spp.* and *Eustachys paspaloides.* In terms of trees, *Acacia nigrescens* is often dominant in the northern parts, while *A. tortilis* is generally dominant in the south. Other typical trees and shrubs include *Ziziphus mucronata, Sclerocarya birrea, Spirostachys africana, Gymnosporia spp., Dichrostachys cinerea, Euclea spp., Ozoroa engleri, Grewia spp., Bolusanthus speciosus, Combretum imberbe, Balanites maughamii* and several species of *Acacia*.

Savanna vegetation is not immutable and may be altered rapidly by changes in, *inter alia,* fire regime. Both the frequency and intensity of fire are important factors. Furthermore fire intensity is affected by grazing. As grazing intensity increases, grass cover (which is the primary source of fuel for fires in savanna ecosystems) decreases. This has the effect of reducing the intensity of fire. The elimination of hot (high intensity) fires results in the increased survival of saplings and is termed bush encroachment. Although not as yet quantified, large areas of the savanna ecosystem are suffering from bush encroachment. Bush encroachment is often associated with a decrease in species richness, and is therefore not desirable.

The predominant biological resources currently utilised or potentially available from this ecosystem are similar to that available in the grassland ecosystem but include fuel and timber (Table 2.3). The magnitude to which each of these biological resources has been, or currently is being, utilised varies

extensively depending on land use. In protected areas biological resources are generally utilised at low levels, but poaching is a concern in certain areas (most commonly with regard to the illegal harvesting of medicinal plants and bush meat). On SNL, however, biological resources are used extensively. Wildlife resources (especially antelopes and their mammalian predators) have been decimated in this ecosystem. With the exception of protected areas, and areas under commercial cultivation, the remainder of the savanna ecosystem is heavily utilised for livestock grazing. On SNL, grazing pressure can be enormous and there are no mechanisms in place to prevent over-grazing. Fauna and flora are utilised both for the preparation of natural medicine and for food. This has lead to the destruction of wildlife (as outlined above), and is now contributing to the demise of medicinal plants. There is currently no mechanism in place to ensure the regeneration of what is being harvested. There appears to be an increase in the harvesting of medicinal plants, but this trade has not been quantified. It is not clear whether medicinal plants are harvested at differential rates in the different ecosystems. A major threat to this ecosystem is the continued clearing of natural vegetation for the cultivation of sugar cane. This exercise has continued unabated over the past few years despite the constraint of limited water availability. Another major threat to this ecosystem is the unsustainable harvesting of woody vegetation for timber and fuel wood. Harvesting of woody vegetation appears to be widespread and on the increase. Furthermore, there is no mechanism in place to ensure the regeneration of this biological resource. The selling of fuel wood along certain routes in the lowveld appears to have grown exponentially over the past decade without any apparent enforcement of control measures (such as the Flora Protection Act). As mentioned above, overgrazing and poor fire management has resulted in bush encroachment over large areas of SNL. The effects of this bush encroachment are fully understood, but often includes a loss of biodiversity. It has been shown that areas suffering from bush encroachment support a lower diversity of birds. Alien plant invasion is a problem in parts of this ecosystem, especially along water courses. *Lantana camara, Psidium guajava* and *Chromolaena odorata* have spread over large areas of this ecosystem, while the herb *Parthenium hysterophorus* is often evident in the grass layer in disturbed areas. Finally, parts of the ecosystem have been lost by way of inundation as a result of dam construction. New dam sites are still being proposed in this ecosystem.

**Forests**

The forest ecosystem is highly restricted, covering only 1% of South Africa. This ecosystem is characterised by woody vegetation with a continuous canopy, with the dominant vegetation consisting mostly of evergreen trees. It extends from the southern Cape along the eastern seaboard of South Africa to the Soutpansberg in the Northern Province (South Africa). In Swaziland, forest vegetation is usually found at moderate to high elevations mainly in the west of the country and in ravines of the Lubombo Mountains. At high altitudes, forest patches are interspersed amongst the grassland and play an important role in supporting biodiversity. Effective conservation of this ecosystem is hampered by its fragmented nature.

In a recent inventory of the forests of Swaziland using remote sensing data and field verification, the total cover of afromontane forest was placed at 11 349 ha (0.65% of the land area of Swaziland) and riparian forest at 25 207 ha (1.45% of Swaziland). In total, forests cover an estimated area of 870 $km^2$ or 5% of Swaziland (Thurland, 1999)(refer to Table 2.1). Only 2% of these forests are formally

protected, while a further 5% are recognised as protection worthy. A quarter of these forests have been converted to some other form of land use (predominantly forestry). Considering the tiny area encompassed by this ecosystem, this figure is highly significant.

Forests are legendary for the high species diversity that they support. Although, in Swaziland, grasslands and savannas support more species in total, forests support more species per unit area. Three species of endemic plants, and no known endemic animals occur in Swaziland's forests.

Swaziland's forests can be divided into three broad categories, namely: afromontane forests (mostly at altitudes above 1000 m), riverine forests (mostly at altitudes below 900 m) and forests in the Lubombo Mountains. Typical plant species include *Englerophytum magalismontanum, Syzygium cordatum, Syzygium gerrardii, Psychotria capensis, Diospyros whyteana, Maesa lanceolata, Cussonia spp., Gymnosporia mossambicensis, Heteropyxis spp., Peddiea africana, Scolopia spp., Trichocladus grandiflorus, Ficus spp., Dalbergia armata, Xymalos monospora, Combretum kraussi, Clausena anisata,* and *Rhus spp.*. A number of rare or range-restricted species also occur here such as the cycads *Encephalartos umbeluziensis* and *E. aplanatus*. With the exception of birds, vertebrates are not well represented in forests (Table 2.2). However, several species of birds are restricted to forests including: *Lioptilus nigricapillus, Glaucidium capense* and *Smithornis capensis*.

Forest ecosystems generally tend to be fragile and are easily degraded by humans (Masson, 1991) . Over-harvesting of woody plants quickly opens up and dries out a forest exposing it to fire. Fire, although a natural and necessary component of grasslands and savannas, has a devastating effect on forests.

The predominant biological resources currently utilised or potentially available from this ecosystem are similar to that available in the savanna ecosystem but generally excludes livestock fodder (Table 2.3). The magnitude to which each of these biological resources has been, or currently is being, utilised varies extensively depending on land use. In protected areas biological resources are generally utilised at low levels, but persistent poaching of certain resources is of concern (e.g. cutting of the tree *Androstachys johnsonii*). Fauna and flora are utilised both for the preparation of natural medicine and for food. This has lead to the destruction of wildlife, and is now contributing to the demise of medicinal plants. There is currently no mechanism in place to ensure the regeneration of what is being harvested. There appears to be an increase in the harvesting of medicinal plants, but this trade has not been quantified. Another major threat to this ecosystem is the unsustainable harvesting of woody vegetation for timber and fuel wood. Harvesting of woody vegetation appears to be widespread and on the increase. Furthermore, there is no mechanism in place to ensure the regeneration of this biological resource. Alien plant invasion is a problem in parts of this ecosystem, especially in riparian vegetation where *Lantana*, *Chromolaena* and *Melia azedarach* have secured a foothold.

**Aquatic ecosystems**

The aquatic ecosystem covers the smallest area of Swaziland, yet it supports a relatively high density of species (i.e. species per unit area) and plays an important role in the functioning of the other

ecosystems. Riparian forest, for example, would not exist in the absence of the aquatic ecosystem. Approximately 1% of Swaziland falls under this ecosystem, a proportion similar to that of South Africa (Table 2.1). Only 2% of this ecosystem is currently protected, whilst a further 5% is regarded as protection worthy. Seven percent has been converted to other forms of use (such as commercial agriculture and damming).

Despite its small extent of coverage, the aquatic ecosystem supports a rich biodiversity. A total of 98 species of plants occur exclusively in this ecosystem. This does not reflect the full diversity supported by this ecosystem as numerous habitats in the other ecosystems require water to sustain them (e.g. riparian and riverine vegetation). Vertebrates are also well represented in this ecosystem (refer to Table 2.2). No endemics occur in this ecosystem and few aquatic plants are currently threatened. However, a significant number of aquatic vertebrates are currently threatened. These include numerous species of waterbirds whose habitats have become increasingly degraded and destroyed (Monadjem *et al.*, in preparation). As a proportion of the total number of species occurring in the ecosystem, the aquatic ecosystem suffers the highest impact of exotic species. Nearly 10% of all aquatic plants are exotics, whilst in the other ecosystems this figure is below 3%. Although the number of exotic species does not necessarily reflect the density of exotics in an ecosystem, aquatic invasives do have the potential to completely dominate aquatic systems (e.g. *Salvinia molesta*).

The aquatic ecosystem differs considerably from the other ecosystems in its mode of functioning. The impact of fire and herbivory, so significant in the other ecosystems, is not as obvious in the aquatic ecosystem. Veld mismanagement, such as over-grazing, is one of the causes of erosion. This soil makes its way into the aquatic ecosystem leading to increased siltation. Since silt load affects the species composition of both fish and aquatic invertebrates (Hyslop, 1994), mismanagement of neighbouring ecosystems impacts directly on the aquatic ecosystem. Hence the state of aquatic ecosystem is often determined by the state of neighbouring ecosystems. Certain habitats in the aquatic ecosystem are extremely fragile. For example, the high-altitude marshes, which are generally found above 1000 m, are easily degraded by cattle grazing and trampling, and can be completely destroyed by draining (which is a relatively simple operation). Despite their fragility, these highveld marshes play an important ecological-hydrological role by, *inter alia*, absorbing storm water in the wet season and continuously releasing water in the dry season, thereby ensuring an adequate supply of water throughout the year.

The aquatic ecosystem is probably the least studied ecosystem in Swaziland. Little is known about the range and distribution of habitats available. The only regular monitoring conducted in this ecosystem is the African Waterfowl Census which counts waterbirds twice per annum at major wetlands throughout the country.

The predominant biological resources currently utilised or potentially available from this ecosystem are water, natural medicine and food, fisheries and products made from reeds and sedges (Table 2.3). Furthermore, some aquatic ecosystems, such as wetlands, are also exposed to grazing by livestock. The magnitude to which each of these biological resources has been, or currently is being, utilised varies extensively depending on land use. In protected areas there is little or no exploitation of

biological resources. On SNL, however, biological resources are used extensively. On SNL, grazing pressure can be enormous and there are no mechanisms in place to prevent over-grazing. Wetlands are very susceptible to overgrazing and trampling by livestock, and are easily degraded. Fauna and flora are utilised both for the preparation of natural medicine and for food. This has lead to the destruction of wildlife (as outlined above), and is now contributing to the demise of medicinal plants. There is currently no mechanism in place to ensure the regeneration of what is being harvested. There appears to be an increase in the harvesting of medicinal plants, but this trade has not been quantified. Wetlands have also been degraded or destroyed as a result of the construction of roads and buildings. As mentioned above, erosion is having a serious impact on the streams and rivers of the country by increasing the silt load. Soil erosion has reached critical levels in parts of the country (Mushala, 2000), and does not appear to be under control. Siltation may thus be expected to deteriorate. Further threats to this ecosystem include industrial pollution (mostly entering the Usushwana River from Matsapha Industrial Area), urban waste and agricultural chemicals. Alien plant invasion is a problem in parts of this ecosystem, especially *Salvinia molesta*.

**2.3 Analysis of Ecosystems Using Biodiversity Criteria**

The four ecosystems can be ranked in order of importance for conservation by using the internationally recognised biodiversity criteria of species richness, endemism, protection and conversion. The results of this analysis are presented in Table 2.4. Ecosystems are scored on the basis of how many species have been recorded in them and how many of them are endemic to that ecosystem (based on information for plants and vertebrates only). It is possible that the results of this analysis might have been different had information been available for other groups of organisms such as invertebrates. However, with a lack of critical data, this analysis had to be restricted to plants and vertebrates (as has been the case for studies in most other nations). Also included in the analysis was consideration of the area currently under formal protection, as well as the area converted to other use. The total coverage of the four different ecosystems varies by a factor of 40 (the savanna ecosystem is almost 40 times the extent of the aquatic ecosystem). Therefore, to simply express the total area under protection or conversion would not be logical. Hence, the proportion of each ecosystem protected or converted has also been applied as criteria.

It is evident from Table 2.4 that the grassland ecosystem has the highest ranking (i.e. most important from a biodiversity conservation perspective), followed by the forest and savanna ecosystems. The aquatic ecosystem ranks lowest (i.e. least concern). The results of this analysis, though potentially useful, must be read with caution. Firstly, the data on species richness and endemism are incomplete (as mentioned above). Secondly, and more importantly, this analysis is conducted at the very broad scale of “ecosystem”. Within each of these ecosystems, there numerous habitats varying in their conservation status. For example, within the aquatic ecosystem, high-altitude wetlands (marshes) support a rich diversity of flora and fauna, are poorly protected and have, to a large extent, been converted or degraded. This is not reflected in the current analysis (presented in Table 2.4). Neither is the biological uniqueness of the Lubombo Mountains (discussed in section 2.2 above) reflected in this analysis. It must, therefore, be recognised, that while this analysis provides useful insight into the overall conservation value of the four ecosystems, it does not necessarily reflect the true diversity within each ecosystem. Finally, the influence of the aquatic ecosystem extends well beyond its boundary into that of neighbouring ecosystems. Therefore, the aquatic ecosystem plays a pivotal role

in the function of many habitats in other ecosystems. This crude analysis does not reflect this either. This analysis, then, is probably appropriate for the three terrestrial ecosystems, but inappropriate for the aquatic ecosystem.

It does not come as a surprise that, of the terrestrial ecosystems, grasslands have the highest priority. On a southern Africa scale, grasslands support numerous endemics, have suffered major conversion to other forms of land use, and are poorly represented in protected areas. Forests are also of conservation concern due to the high density of species occurring in them. However, compared to grasslands, they support fewer endemics (both in Swaziland and in southern Africa), and are marginally better represented in protected areas. In southern Africa, the highly diverse savanna ecosystem is extensive, supports few endemics and is well protected. Within Swaziland, this ecosystem is better represented in protected areas than any of the other three ecosystems. However, only 5% of the savanna ecosystem is currently conserved, far short of the IUCN's recommended 10%. Furthermore, this ecosystem is currently facing severe pressure from commercial agriculture (mostly for sugar cane cultivation). This ecosystem, therefore, should not simply be ignored on the basis of its low ranking.

**Table 2.1.** Status of ecosystems of Swaziland. Figures are in $km^2$.

| | **Grassland** | **Savanna** | **Forest** | **Aquatic** | **Total** |
|---|---|---|---|---|---|
| Extent of coverage[1] | 7990 (46%) | 8327 (48%) | 870 (5%) | 213 (1%) | 17 400 (100%) |
| Coverage in South Africa[2] | 336 544 (26%) | 426 216 (34%) | 7265 (1%) | 10 427 (1%) | 780 452 (62%) |
| Area formally protected[3] | 190 (2%) | 426 (5%) | 20 (2%) | 4 (2%) | 640 (4%) |
| Area informally protected[3] | 4 (0%) | 164 (2%) | 3 (0%) | 3 (1%) | 174 (1%) |
| Area converted:[3] | | | | | |
| Forestry | 1400 | 120 | 210 | 0 | 1730 |
| Sugar cane | 0 | 520 | 0 | 0 | 520 |
| Urbanisation | 145 | 205 | 2 | 0 | 352 |
| Other | 435 | 1215 | 14 | 14 | 1678 |
| Total | 1980 (25%) | 2060 (25%) | 226 (26%) | 14 (7%) | 4280 (25%) |
| Converted post-1985:[3] | | | | | |
| Forestry | 27 | 0 | 3 | 0 | 30 |
| Sugar cane | 0 | 100 | 0 | 0 | 100 |
| Urbanisation | 129 | 60 | 1 | 0 | 190 |
| Other | 100 | 15 | 0 | 0 | 115 |
| Total | 256 (3%) | 175 (2%) | 4 (0%) | 0 | 435 (3%) |

[1] Source Roques & Dobson (in lit.)
[2] Source Low & Rebelo (1998), but for aquatic ecosystem Fairbanks *et al.* (2000)
[3] Source Deal *et al.* (2000)

**Table 2.2.** Species diversity by ecosystem.

| | Grassland | Savanna | Forest | Aquatic | Total |
|---|---|---|---|---|---|
| Flora:[1] | | | | | |
| Trees | 78 (19%) | 261 (63%) | 115 (28%) | 4 (1%) | 412 |
| Grasses | 130 (60%) | 103 (47%) | 3 (1%) | 4 (2%) | 218 |
| Plant resource species | 158 (41%) | 256 (66%) | 55 (14%) | 11 (3%) | 387 |
| Exotics | 32 (44%) | 30 (41%) | 2 (3%) | 9 (12%) | 73 |
| Total | 1225 (51%) | 1136 (47%) | 238 (10%) | 98 (4%) | 2418 |
| Fauna (vertebrates):[2] | | | | | |
| Fish | 0 | 0 | 0 | 51 (100%) | 51 |
| Amphibians | 9 (21%) | 10 (24%) | 1 (2%) | 37 (88%) | 42 |
| Reptiles | 51 (46%) | 76 (69%) | 12 (11%) | 7 (6%) | 110 |
| Birds | 138 (28%) | 290 (58%) | 91 (18%) | 97 (19%) | 500 |
| Mammals | 49 (39%) | 95 (75%) | 13 (10%) | 1(1%) | 127 |
| Total | 247 (30%) | 471 (57%) | 117 (14%) | 192 (23%) | 821 |
| Threatened: | | | | | |
| Flora[3] | 161 (70%) | 71 (31%) | 53 (23%) | 6 (3%) | 231 |
| Fauna (vertebrates)[4] | 44 (38%) | 51 (44%) | 15 (13%) | 27 (23%) | 116 |
| Endemics: | | | | | |
| Flora[5] | 13 (72%) | 2 (11%) | 3 (17%) | 0 | 18 |
| Fauna (vertebrates)[4] | 1 (100%) | 0 | 0 | 0 | 1 |
| Southern African endemics (birds)[6] | 26 (50%) | 13 (25%) | 12 (23%) | 1 (2%) | 52 |

[1] L. Dobson (in lit.)
[2] Monadjem (1997b)
[3] from Flora Protection Bill (2000)
[4] Monadjem *et al.* (in preparation)
[5] from SNTC website
[6] Clancey (1986)

**Table 2.3.** Major biological resources available in, and major threats to, each ecosystem.

| | Grassland | Savanna | Forest | Aquatic |
|---|---|---|---|---|
| **Biological resources** | | | | |
| livestock fodder | ● | ● | | |
| natural medicine | ● | ● | ● | ● |
| natural food | ● | ● | ● | ● |
| fuel | | ● | ● | |
| timber | | ● | ● | |
| water | | | | ● |
| wildlife | ● | ● | ● | |
| fisheries | | | | ● |
| reed products | | | | ● |
| **Threats** | | | | |
| afforestation (exotic plantations) | ● | | | |
| erosion | ● | | | ● |
| rain fed cropping | ● | | | |
| sugar cane cropping | | ● | | |
| urbanisation | ● | ● | ● | |
| alien plant invasion | ● | ● | ● | ● |
| bush encroachment | | ● | | |
| resource harvesting | ● | ● | ● | ● |
| pollution | | | | ● |
| livestock grazing & trampling | ● | | | ● |

**Table 2.4.** Comparison of ecosystems on biodiversity criteria. Ecosystems are ranked on a scale of 1 to 4 using biodiversity criteria of species richness, endemism, protected areas and conversion to other use. The lowest ranking (1) indicates the lowest importance for that criterion. The ecosystem with the highest total score ranks as the ecosystem with the highest priority from a conservation perspective. Where ecosystems are tied, the score is divided equally between them.

| | **Grassland** | **Savanna** | **Forest** | **Aquatic** |
|---|---|---|---|---|
| Species richness[1] | 3 | 4 | 2 | 1 |
| Endemism[1] | 4 | 2.5 | 2.5 | 1 |
| Threatened[1] | 4 | 3 | 2 | 1 |
| Total area protected | 2 | 1 | 3 | 4 |
| Proportion of ecosystem protected | 2.7 | 1 | 2.7 | 2.7 |
| Total area converted | 3 | 4 | 2 | 1 |
| Proportion of ecosystem converted | 2.5 | 2.5 | 4 | 1 |
| Total score | 21.2 | 18 | 18.2 | 11.7 |
| Ranking | 1st | 3rd | 2nd | 4th |

[1] Plants and vertebrates only

**Figure 2.1**. Distribution of the four ecosystems in Swaziland (prepared by K. Roques, L. Dobson and G. Murdock).

## 2.4 Agro-biodiversity in Swaziland

Agriculture is the backbone of the economy of Swaziland. Swaziland covers an area of over 1 736 000 ha, of which approximately 129 980 ha is being used for crop production. Grazing land covers about 1 252 314 ha and commercial forest plantations cover 86 758 ha. Thus, over 80% of Swaziland is dedicated to agriculture. Agricultural production in Swaziland is either done commercially (mainly on title deed land) or on a subsistence basis (mainly on Swazi Nation Land).

(i) The main commercial crops grown in Swaziland are presented in Table 2.5 and discussed below.

*Sugar cane*

Sugar cane is grown by both large-scale companies as well as by medium/small-scale growers. A total of 13 varieties of sugar cane are currently grown in Swaziland covering an area of 40 131 ha.

*Cotton*

Four varieties of cotton are currently grown in Swaziland. The total area under cotton production is around 26 000 ha. Most of the cotton is rain fed (ie. not irrigated) especially on SNL and medium-scale growers.

*Citrus*

Three main types of citrus are cultivated in Swaziland: grapefruits (three varieties), oranges (nine varieties) and lemons (three varieties). Citrus estates currently cover almost 2200 ha of land.

*Pineapple*

Pineapples are grown only in the Malkerns Valley where they cover an area of 918 ha (although about one third of this area is fallow at any one time).

*Tobacco*

Tobacco production in Swaziland is limited to approximately 400 ha of land in the Shiselweni and Lubombo regions

*Non-citrus fruit*

Non-citrus fruit grown commercially in Swaziland include bananas, litches, mangoes, pecan nuts and avocadoes. These orchards cover an area of about 126 ha.

Maize

Maize is grown both as a commercial and subsistence crop. The area of land under maize cultivation on Swazi Nation Land in the 1996/1997 season was 60 905 ha (Government of Swaziland, 1997).

*Forestry*

Plantations in the Highveld have traditionally grown exotic timber species determined by the commercial commodity produced. The softwood plantations of Sappi-Usuthu are composed mainly of pulp-producing species such as *Pinus patula* and *P. elliotii*. Other species grown but in smaller quantities are *P. oocarpa, P. tecunumani* and *P. kesiya*. A number of hybrid crosses are also grown.

The hardwood plantations supplying sawlog timber are a mix of *Eucalyptus grandis* and *Pinus* species. The area of forest occupied by each species is included in Table 2.6.

(ii) The following plants and animals are produced or harvested on a subsistence basis.

Maize is the staple food of Swaziland. Maize is grown as a rain fed crop, and hence the yield depends on the availability of rain. Maize production over the past ten years has ranged from a low of 58 241 tons in the drought of 1991/92, to a high of 135 627 in the high-rainfall year of 1995/96. Other important cereals grown on a subsistence basis are millet and sorghum.

Although legumes are an important crop in the diet of Swazis, they are not grown to the same extent as maize. Legumes grown in Swaziland include beans, jugo beans (bambara nuts), cow peas and groundnuts. Most of these crops are grown for home consumption. Cow peas and groundnuts are intercropped with maize, while beans are mostly grown as a second crop when early planted maize has been harvested. The cultivation of jugo beans has traditionally been restricted to virgin land.

*Livestock*
Table 2.7 presents the types and numbers of livestock occurring in Swaziland. Cattle and goats are the main types of livestock kept. The Nguni is an indigenous breed which is better adapted to the environmental conditions of Swaziland than exotic breeds, and thus should be prevented from extinction through hybridisation. The same applies to the indigenous breed of goat and poultry.

*Fisheries*
There are four main species of fish that are cultured in Swaziland. Two of these species are exotics and have been introduced in recent times: common carp (*Cyprinus carpio*) and rainbow trout (*Oncorhynchus mykiss*); while two are indigenous: tilapia (*Oreochromis mossambicus*) and catfish or barbel (*Clarias gariepinus*).

**Table 2.5** Commercially grown crops in Swaziland from Earnshaw (1998).

| **Crop** | **Area under commercial cultivation (ha)** |
|---|---|
| Sugar cane | 40 131 |
| Cotton | 26 000 |
| Citrus | 2 200 |
| Pineapple | 918 |
| Tobacco | 400 |
| Non-citrus fruit | 126 |
| Maize | not available |
| Beans | 6 194 |
| Jugo beans | 3 097 |
| Cow peas | 2 789 |
| Goundnuts | 7 174 |

**Table 2.6** The total forest area (ha) occupied by the different tree species grown commercially in Swaziland from Earnshaw (1998).

| **Tree species** | **Area occupied by tree species (ha)** | **Percentage** |
|---|---|---|
| *Pinus elliottii* | 26 642 | 27.6 |
| *Pinus patula* | 44 714 | 46.3 |
| *Pinus taeda* | 5 051 | 5.2 |
| Other *Pinus* species | 2 421 | 2.5 |
| *Eucalyptus grandis/saligna* | 14 587 | 15.1 |
| Other gums | 1 525 | 1.6 |
| Wattle | 1 572 | 1.6 |
| Other tree species | 175 | 0.2 |
| **TOTAL** | 96 687 | 100 |

**Table 2.7** The different types of livestock in Swaziland from the national livestock population census of 1999 (Government of Swaziland, 1999).

| **Type of livestock** | **Number of animals** |
|---|---|
| Cattle | 599 067 |
| Dairy cows | 3 102 |
| Indigenous sheep | 15 831 |
| Exotic sheep | 3 865 |
| Indigenous goats | 358 832 |
| Exotic goats | 3 865 |
| Indigenous pigs | 26 767 |
| Exotic pigs | 10 670 |
| Donkeys | 12 280 |
| Horses | 1 276 |
| Mules | 39 |
| Poultry | 1 360 381 |

# 3.0 Assessment of Current Conservation and Management of Biodiversity in Swaziland

## 3.1 Institutional Framework

Although the work of every government ministry impacts on the biological diversity of Swaziland, there are three main government institutions/bodies responsible for managing biodiversity: Swaziland National Trust Commission (SNTC), Swaziland Environment Authority (SEA) and the Ministry of Agriculture and Cooperatives (MOAC). Both SEA and SNTC are currently under the Ministry of Tourism, Environment and Communication (MTEC). In addition to these government bodies there are a number of private bodies and NGOs which also play a role in conserving and managing the biodiversity of Swaziland.

**Swaziland National Trust Commission**
The SNTC is a parastatal organisation that was established by the National Trust Commission Act of 13th March 1972 which was amended in 1973. The mission statement of the SNTC is:

"To conserve Swaziland's natural and cultural heritage through sustainable utilisation of natural resources and promotion of environmental awareness throughout the country."

The SNTC Act, however, restricts the activities of the SNTC to declared parks and reserves, and national monuments. The SNTC Board of Commissioners are appointed by the relevant Minister. In addition to Accounts and Administration, there are five other departments: 1) the Museum, 2) Monuments, Relics and Antiques, 3) Parks and Reserves, 4) Environmental Education, and 5) Community Outreach. Since the SNTC is a parastatal, 90% of its funding comes from government. More about the role of the SNTC is presented in sections 4.2, 4.4 and 4.6.

**Swaziland Environment Authority**
The SEA was established through the Swaziland Environment Authority Act No. 15 of 16th November 1992. The main function of the SEA is to coordinate the government's efforts to incorporate environmental factors into Swaziland's development process.

The SEA Board is comprised of a chairperson, a secretary (the Director of the SEA), and representatives from eight ministries, four NGOs and four private citizens. At present, the SEA staff all fall under a single department headed by the Director.

According to the Act, the SEA has a mandate to carry out the following fifteen obligations:

- Establish guidelines on environmental pollution,
- To assist the Minister in formulating policies on environmental matters,
- To develop, in conjunction with other Government authorities, economic measures that will encourage environmentally sound and sustainable activities,

- To coordinate activities of all bodies concerned with environmental matters and at the same time act as a channel of communication,
- To monitor environmental trends in the country with a view to protecting the environment and improving the environment,
- To carry out immediate and long term studies , investigations, and research on environmental issues,
- To carry out training, skills upgrading and education programmes in order to create national environmental awareness,
- To ensure that environmental matters are catered for in national development planning,
- To act as the focal point in the country's collaboration with regional and international organizations dealing with environmental matters,
- To create and maintain environmental safeguards in all developments that impinge, or are like to impinge, on the environment without necessarily compromising social and economic advancement,
- To report to the Minister any adverse environmental issues as well as make corrective measures,
- To prepare guidelines for environmental impact assessments for all development projects
- To review all projects that have a present or potential environmental impact,
- To control all forms of environmental pollution including those caused by discharge of toxic waste, and
- To institute measures for coordinating and enforcing environmental legislation and observance of international conventions.

These fifteen obligations can be summarised as four main responsibilities, which are to: 1) promote the development of policies, legislation and enforcement mechanisms needed for sound environmental management, 2) coordinate the activities of all bodies concerned with environmental matters and serve as liaison for national and international organisations on environmental matters, 3) monitor trends in the state of the environment, and 4) conduct and promote research on environmental matters, and promote environmental training and education to increase public awareness and participation.

**Ministry of Agriculture and Cooperatives (MOAC)**

MOAC has a number of departments and sections which are currently directly responsible for the conservation and management of biodiversity in the country. The main function of the Fisheries Section is aquaculture and fisheries management.

The role of the Forestry Section is ensure that the forestry resources are managed and conserved optimally in order to prevent harmful consequences of exploitation. This entails maintaining a forest resource inventory and monitoring the rate of deforestation, provision of efficient extension services to farmers and undertaking research on propagation of indigenous and exotic tree species. The Forestry Section has four obligations:

- Promotion of optimum productivity of forest resources.

- Management, protection and conservation of forest resources with due regard to immediate and long-term socio-economic benefits.
- Coordination of timber harvesting, wildlife management and water conservation in cooperation with other ministries.
- Encouragement of wood lots and efficient timber processing.

Not all these obligations, however, are currently being met.

The Gene Bank, situated at the Malkerns Research Station, is responsible for the collection, conservation, documentation and characterisation of plant genetic resources in Swaziland, but with an emphasis on indigenous crops and crop relatives. This unit has collected and conserved (using modern facilities) almost all indigenous crops from around the country. Storage facilities (such as fridges) are funded by the SADC Plant Genetic Resources Centre. All other aspects of the programme are funded by the Government of Swaziland. To date, several researchers (e.g. from University of Swaziland) have utilised material collected by this unit.

The Herbarium is the repository of plant material collected from Swaziland. At present the Herbarium is situated at the Malkerns Research Station, but this is a temporary arrangement. The lack of a permanent site for the Herbarium is of considerable concern, and must surely act to impede the progress of this unit.

A SADC programme recently launched (January 2000) is involved with the conservation and management of farm animal genetic resources. This programme (named the "SADC Farm Animal Genetic Resources Management Program") is being aggressively pursued in Swaziland. The national program coordinator and the team are housed in the Ministry of Agriculture and Cooperatives (Department of Veterinary and Livestock Services) where they have office space and modern computer facilities. The current focus of this unit is characterisation of local breeds of cattle, chickens, goat and sheep. Its three objectives are: 1) to build a data bank comprising the characterisation information; 2) to identify those characteristics of farm animals which require preservation; and 3) to develop breeding programmes which make better use of genetic characteristics of the animals identified. The latter is to be conducted with the direct participation of local communities.

**Private Reserves**

Big Game Parks is a privately owned body which manages three reserves in the country (Mlilwane & Mkhaya Game Reserves, and Hlane Royal National Park, which is held in trust for the Nation by the King). Big Game Parks, thus, contributes to the management of the country's biodiversity.

A few other title deed land (TDL) owners have turned to ecotourism (see section 4.4) as a business venture. Private reserves and game ranches, however, cover only a small area of Swaziland, and thus their contribution to the conservation and management of Swaziland's biodiversity is still limited (mainly to larger mammals). However, the area of land dedicated to ecotourism and game farming (and other conservation-oriented activities) is steadily increasing with the result that these TDL areas may play an important role in the future.

**NGOs**

Yonge Nawe is a leading NGO devoted to environmental issues in Swaziland. However, Yonge Nawe's role is primarily an educational one, and not a management one (see section 4.6 for more information on Yonge Nawe). The Umbuluzi Catchment Association, as its name suggests, is involved with the management and conservation of the Mbuluzi Catchment and the associated biodiversity. Other active NGOs and societies include the Natural History of Swaziland, the Conservation Trust of Swaziland, the Traditional Healers Organisation, the Lubombo Conservancy and the Mhlosinga Wildlife Producers Association.

### 3.2 Analysis of Institutional Framework

The role currently played by the above-mentioned institutions in the conservation of Swaziland's biodiversity is analysed in terms of whether the mandate of the institution includes: 1) creation of a protected area network covering all ecosystems; 2) establishment of programmes for sustainable utilisation of biodiversity (such as community-based natural resource management or CBNRM); 3) conservation of agro-biodiversity; and 4) minimising the risk of LMOs. What is abundantly clear from this analysis, is that the current institutional framework is currently not adequate or effective for conserving Swaziland's biodiversity (refer to Table 3.1). The only aspect of biodiversity conservation which is currently being aggressively pursued is the conservation of agro-biodiversity. Furthermore all the institutions are underfunded and require additional human resources.

This analysis by itself, however, can be misleading. For example, the SNTC manages three gazetted nature reserves which (combined) protect a large portion of the nation's vertebrate diversity (e.g. see Monadjem, 1997b). The SNTC has also actively expanded its protected area network in the past decade. The SNTC, therefore, is playing a critical role in protecting the nation's biodiversity. However, the SNTC does not have the mandate to create a protected area network *covering all ecosystems*. A similar situation exists with regard to the SNTC's Community Outreach Programme and the establishment of sustainable resource management programmes in local communities. The Outreach programme does, *inter alia*, assist local communities (especially those neighbouring SNTC reserves) to manage resources sustainably. For example, Mlawula Nature Reserve was instrumental in the development of Shewula Nature Reserve (a CBNRM programme on SNL). However, the SNTC does not have the legal mandate to establish community-based natural resource management (CBNRM) programmes.

The SEA has also played an important role. For example, the law stipulates that an Environmental Impact Assessment (EIA) must precede any development. The SEA is directly responsible for reviewing these EIAs and issuing compliance certificates where appropriate. Through this EIA process, the erosion biodiversity in Swaziland has certainly been curbed. The SEA is also charged with increasing public awareness on environmental issues (which includes biodiversity). The SEA has also been involved with developing awareness and expertise in the field of biosafety.

Likewise, the Ministry of Agriculture and Cooperatives (MOAC) has significantly contributed to biodiversity conservation. MOAC houses the Gene Bank and the SADC Farm Animal Genetic Resources Management Program. Both these programmes are currently active and producing positive results in terms of the conservation of agro-biodiversity. MOAC is also responsible for developing a forestry policy which will have a significant positive impact on the conservation of

forestry resources and biodiversity.

**Table 3.1** Summary of the current institutional framework with respect to the mandate for the conservation of biodiversity in Swaziland.

| | Institution | | | | |
|---|---|---|---|---|---|
| | SEA | SNTC | MOAC | NGOs | Private |
| **INSTITUTIONAL MANDATE** | | | | | |
| Mandate for creating PA network covering all national ecosystems? | No | Partly | No | No | No |
| Mandate to establish systems of sustainable management of biological resources by local communities? | No | Partly | No | No | No |
| Mandate to conserve agro-biodiversity? | No | No | Yes | No | No |
| Mandate for minimising risk of LMOs? | No | No | No | No | No |
| Mandate for creating public awareness of, and support for, biodiversity? | Yes | Yes | Yes | Yes | No |

**Table 3.2** The Acts of Parliament which directly pertain to, or impact on, the maintenance of biodiversity in Swaziland.

| **Acts relating to biodiversity** | **Ministry/Department involved** |
|---|---|
| *Institutional* | |
| 1) The National Trust Commission Act of 1972<br>- The National Trust Commission Regulations of 1972 | Ministry of Tourism, Environment and Broadcasting, SNTC |
| 2) The Swaziland Environmental Authority Act of 1992 | Ministry of Tourism, Environment and Broadcasting, SNTC |
| *Relating mainly to animals* | |
| 1) Wild Birds Protection Act, No. 45 of 1914 | Ministry of Agriculture |
| 2) Protection of Fresh Water Fish Act, No. 75 of 1937<br>- Fresh Water Fish Regulations of 1937 (amended 1952 and replaced 1973) | Ministry of Agriculture, Department of Fisheries |
| 3) Game Act, No. 51 of 1953 (amended 1964, 1968, 1991 and 1993) | King's Office |
| 4) The Non-Bailable Offences Order of 1993 | Ministry of Justice |
| *Relating mainly to plants* | |
| 1) Forest Preservation Act No.14 of 1910 | Ministry of Agriculture |
| 2) The Flora Protection Act, No. 45 of 1952 (amended 2001) | Ministry of Agriculture |
| 3) Plant Control Act, No. 7 of 1981 (which replaced The | |

| | |
|---|---|
| Plant Protection Act of 1959) | Ministry of Agriculture, SNTC |

### 3.3 Legislation and Policy

To effectively conserve Swaziland's biodiversity, appropriate laws must be in place, and must be enforced. Swaziland's laws concerning the protection of most of its vertebrate animals are among the strongest in Africa. The various laws and conventions pertaining or affecting the maintenance of Swaziland's animal diversity are discussed below. It should be noted that Swaziland does not yet have a Biodiversity Policy (SEAP 1997), although a draft policy does appear in the draft Environmental Policy.

#### Acts of Parliament

All acts of Parliament pertaining to the environment are reviewed in SEAP (1997). The acts of Parliament which pertain to, or impact on, the maintenance of Swaziland's biodiversity are listed in Table 3.2.

The National Trust Commission Act of 1972 allows for the establishment of National Parks and Nature Reserves. The objectives of these parks and reserves are outline in Section 15 of the Act and include the promotion and conservation of indigenous animals and plants and the protection of the natural ecology and environment of the park or reserve. These parks and reserves are to be controlled and supervised by Swaziland National Trust Commission (Section 6). The establishment of this Commission is mentioned in Section 3. Activities that are destructive to the existence of these parks and reserves (as set out in the Objectives in Section 15) are prohibited. Prohibited activities are listed in Section 20 and include, among many others, the killing or injuring of plants and animals, and the removal of any object from within the park or reserve. However, a failure of the SNTC Act is that it does not call for the establishment of a network of protected areas that covers all ecosystems.

The Swaziland Environment Authority Act of 1992 is concerned mainly with the maintenance of a healthy and ecologically functioning environment. Thus, this Act affects the maintenance of Swaziland's biodiversity in the sense that it ensures that the environment, and hence the habitat of many indigenous plants and animals, is not destroyed. The functions and responsibilities of the Swaziland Environment Authority (established in Section 4) are listed in Section 5 and include the setting of standards relating to the pollution of air, water and land, and the monitoring and control of any environmental pollution.

Of particular significance is the Game Act of 1953 (King's Office) which was practically replaced in 1991 and slightly amended in 1993. This Act provides for the harsh punishment of illegal hunting. In the case of illegal hunting of Specially Protected Game (which includes both species of rhino, elephant and lion) the offender, if found guilty, is liable to imprisonment without the option of a fine (Section 8). In the case of the illegal hunting of Royal Game (which includes nearly all medium and large-sized mammals and all birds except for Helmeted Guineafowl *Numida meleagris* which, incidentally, has been incorrectly recorded as the Crowned Guineafowl *Numida mitrata*) the guilty offender is liable to pay a fine of up to E30 000 or spend up to five years in prison. Furthermore, the Non-Bailable Offences Order of 1993 cites the contravention of Section 8 ("Prohibition of hunting

and dealing in specially protected and royal game") of the Game Act as a non-bailable offence. Thus persons charged with illegal hunting are not granted bail.

Since the passing of the amendments of 1991 there has been a concomitant decrease in poaching in the Big Game Parks (T.E. Reilly, personal communication). It would thus appear that the revitalized Game Act is serving its function (which is the protection of wild game). The Game Act, however, does not list (and therefore does not protect) any species of reptiles (other than crocodiles and pythons), amphibians, fish or invertebrates. These latter groups, thus, do not currently enjoy any formal protection in Swaziland.

The Flora Protection Act of 1952 (Ministry of Agriculture and Cooperatives) provides legal protection to a small group of plants (30 genera and species). This Act has now been revised, passed by Parliament and is currently awaiting the signature of the King. The new and improved Flora Protection Bill provides protection for over 200 species, with harsh punishment for offenders (up to E2 500 fine or 2 years in prison). It remains to be seen whether this new Act will be enforced. The Act also makes provisions for the establishment of botanical gardens.

The Protection of Fresh Water Fish Act of 1937 (Ministry of Agriculture and Cooperatives) provides some protection to indigenous species of fish by stipulating a "close season" during which time fishing is not permitted (Section 3), and also by prohibiting the capture of fish by certain destructive means (Sections 8 and 9). However, no formal protection is given to specially threatened species or species whose populations within Swaziland are currently on the decline.

The Plant Control Act of 1981 (Ministry of Agriculture and Cooperatives) prohibits the exportation of indigenous plants without a written permission from the Swaziland National Trust Commission.

- It protects the phytosanitary condition of our flora by insisting on a phytosanitary certificate for all soil and plant material entering the country.
- The Swaziland Citrus Board is empowered to authorize the phytosanitary status of citrus consignments.
- The Minister of Agriculture is solely responsible to regulate or prohibit the importation of wild mushrooms.
- The Permanent Secretary in the Ministry of Agriculture ensures the protection of land from noxious weeds. The secretary also grants permission to dispose of or use for building or manufacturing any article of timber infested by wood borer. This serves to protect our timber trees from certain insect pests.
- Citizens of Swaziland are empowered to notify inspectors in the Ministry of Agriculture about the appearance of flying locusts, nymphs or eggs deposited by locusts in their property. This protects our flora from devastation by brown or red locusts (including *Locusta pardalina* and *Nomadacris septemfasciata*). Nurseries must be registered and inspected.

Certain sections of the Plant Control Act of 1981 make reference to animals. Part II, III, IV, VIII and IX outline measures to control pests and the importation of alien (exotic) species. Section 14 of the

Act prohibits the importation of Second Schedule items which includes *inter alia* all alien animals. Since alien species are often a threat to the indigenous fauna and flora, this section of the Act, if enforced, should contribute positively towards the maintenance of Swaziland's biodiversity.

### 3.4 Regional and International Conventions

Swaziland has signed and ratified numerous International Treaties or Agreements that affect the environment (reviewed in SEAP). Of these, the following directly impact on biodiversity conservation:

- United Nations Framework Convention on Climate Change (1992).
- Convention on Biological Diversity (1992).
- United Nations Convention to Combat Desertification (1994).
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973).
- African Convention on the Conservation of Nature and Natural Resources (1968).

Swaziland has signed the following conventions, but has not yet ratified:

- Convention on the Conservation of Migratory Species of Wild Animals (1979).
- Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (1994).
- World Heritage Sites (1972).

### 3.5 In-situ Conservation

*In-situ* conservation refers to the conservation of plants and animals in their natural habitats. *In-situ* conservation is generally viewed as the preferred method of conservation world-wide. An analysis of the effectiveness of the current protected areas network in Swaziland has been presented in sections 2.2 and 2.3. This section deals with the location, administration and management of the current protected areas network. This section has relied heavily on the Forest Policy report on the identification of protection worthy areas (Deall *et al.*, 2000).

#### Nature reserves and game parks

There are a total of 17 conservation areas in Swaziland (Table 3.3; Deall *et al.*, 2000) of which six are gazetted protected areas. Three are controlled by the Swaziland National Trust Commission (Malolotja, Mlawula and Mantenga), and three by Big Game Parks (Mlilwane, Hlane and Mkhaya). All except Hlane (which was proclaimed under the Game Act of 1953) have been proclaimed under the SNTC Act. These six gazetted protected areas cover 86% of the conservation area network. The remaining 11 conservation areas (Mhlosinga, Mbuluzi, Simunye, Phophonyane, Muti Muti, Shewula, Sibhetsumoya, Oberland, Hawane, Nisela and Shonalanga) are not gazetted and therefore have no legal status. This limits their security as conservation areas, as demonstrated by Ubombo Sugar's plan to cultivate sugar cane on 100 ha in Mhlosinga Nature Reserve (covering 1/4 of its area). There are several privately-owned ranches (e.g. IYSIS) that contain wild game but cannot be considered nature reserves or game parks at this stage, as their main objective is not the conservation of

biodiversity.

Of the 17 conservation areas, some are contiguous e.g. five conservation areas (Hlane, Mlawula, Shewula, Mbuluzi and Simunye) together form an area in excess of 42 000 ha. Mlilwane and Mantenga are also connected, while Malolotja adjoins Songimvelo Nature Reserve in South Africa to form a trans-national conservation area of over 40 000 ha. With the exception of Mkhaya and Nisela, the remaining conservation areas are all less than 500 ha, making them too small to support viable populations of most species.

The spatial distribution of these conservation areas is not even across Swaziland. Most of the conservation areas (10) are situated in the eastern third (10 areas) and northern third (9 areas) of the country, with a shortage of conservation areas in the southern third, and a noticeable lack of conservation areas in the south western quarter (Figure 3.1).

Of the 17 conservation areas, only Shewula is on SNL. This conservation area was recently established (1999) with the help of Mbuluzi and Mlawula with the aim of generating sustainable income for the local community. The success of Shewula will surely set a precent for the establishment of CBNRM on SNL, and must therefore be viewed as critical.

Thirty-four protection worthy areas were identified in an anonymous 1979 report. These areas are distributed throughout Swaziland and cover a large range of vegetation associations and habitats. However, only four of these areas (Mlilwane, Hlane, Mlawula and Malolotja) have legal protection (i.e. proclaimed). The remaining 30 areas lie outside of formally protected areas. The criteria used in this assessment are not quite clear. The report states that the "criteria used in this identification exercise were based principally on maintaining the greatest possible degree of endemic diversity both on the microscale of the individual parks and on the macroscale of the park system within the Kingdom generally". However, the units of measurement are not stated clearly. Despite this shortcoming, this report remains the only field-based survey of protection worthy areas in Swaziland.

A recent desktop survey (Deall *et al.*, 2000) reviewed the subject of protection worthy areas and identified 44 such areas (Figure 3.2) based on clear, but crude, criteria in five main categories, viz, biological value, physical value, socio-economic value, long-term sustainability value and availability for protection. In addition, these 44 areas were ranked according to their scores, providing a prioritised list of protection worthy areas. The findings of this desktop study need, urgently, to be corroborated by field-based studies.

**Royal Burial Grounds**

Royal Burial Grounds (in the Mdzimba Mountains and in the Mhlosheni area) are strictly off-limits to the public and, hence, enjoy a level of protection sometimes surpassing that of proclaimed nature reserves and game parks. Despite being well protected, Royal Burial Grounds generally cover far smaller areas than reserves. Furthermore, since Royal Burial Grounds are not open to the public, they have not been well surveyed resulting in the biodiversity of these areas being poorly known. Hence the conservation value of these areas remains unknown.

**Table 3.3** Protected areas in Swaziland (from Deall *et al.*, 2000).

| **Tenure** | **Protected Area** | **Size (ha)** | **Total by tenure** |
|---|---|---|---|
| SNTC | Malolotja Nature Reserve | 17 400 | |
| | Mlawula Nature Reserve | 17 400 | |
| | Mantenga Nature Reserve | 200 | |
| | Hawane Nature Reserve | 100 | 35 100 |
| Royal | Hlane Royal National Park | 17 800 | |
| | Mlilwane Game Reserve | 4 700 | 22 500 |
| SNL | Shewula Nature Reserve | 3 200 | 3 200 |
| Private | Mkhaya Game Reserve | 8 000 | |
| | Mbuluzi Game Reserve | 2 400 | |
| | Simunye Nature Reserve | 1 900 | |
| | Nisela | 1 500 | |
| | Mhlosinga Nature Reserve | 400 | |
| | Sibhetsumoya | 400 | |
| | Muti Muti Nature Reserve | 200 | |
| | Ovendale Nature Reserve | 200 | |
| | Phophonyane Nature Reserve | 200 | |
| | Shonalanga Nature Reserve | 100 | 15 300 |

**Figure 3.1.** Map showing the distribution of currently protected areas (from Deall *et al.*, 2000).

**Figure 3.2.** Map showing the distribution of the 44 protection worthy areas (from Deall *et al.*, 2000).

### 3.6 Ex-situ Conservation

*Ex-situ* conservation refers to the conservation of plants and animals in non-natural habitats for example in zoos, botanical gardens and seed storage facilities.

#### Animals

There are currently few *ex-situ* measures in place for the conservation of indigenous, non-domestic animals. There are no reputable zoos, snake parks or crocodile farms (although crocodiles are being kept in captivity by a few land-owners). Ostriches are being bred in captivity on several privately owned properties, the largest population being controlled by Big Game Parks. However, all of the ostriches currently occurring in Swaziland (either in captivity or in the wild) originate from sources outside of the country and genetically do not represent the (extinct) indigenous population.

A few species of large herbivores (e.g. roan, sable, tsessebe, elephant) and large carnivores (e.g. lion, cheetah, leopard) are kept in a semi-wild state at Hlane National Park, Mkhaya Game Reserve, Mlilwane Game Reserve and a few other nature reserves and private ranches. These areas form important refuges for these threatened species in Swaziland, and may serve as focii for future re-introductions to areas where the species are currently locally extinct.

Nguni cattle (an indigenous breed adapted to the Swazi environment) are being conserved at Nsalitje and other areas. Some measures are in place to conserving indigenous goats at Manyoyaneni Ranch (Big Bend). Breeding programmes will be developed for other local farm animals (see section 3.1 above).

Other than for farm animals, there is currently no justification for the development of *ex-situ* initiatives to conserve animal diversity in Swaziland. *Ex-situ* conservation measures for animals is generally prohibitive expensive. Furthermore, there are no endemic animals that are critically endangered which would require urgent intervention to prevent their extinction.

#### Plants

*Ex-situ* conservation of plant genetic resources in Swaziland is the formal responsibility of the Gene Bank (located at the Malkerns Research Station, Ministry of Agriculture and Cooperatives). At present, the Unit's effort is expended on collecting and conserving genetic resources from crops and crop relatives, a task which it has conducted with considerable success (see section 3.1 above).

Nurseries are an important repository of plant material. There are numerous private nurseries scattered around the country, most of which deal mainly in exotic species. A small number of nurseries deal in indigenous species in the Manzini, Simunye and Maguga areas. However, there is a real need for nurseries specialising in indigenous species.

The National Herbarium is situated at the Malkerns Research Station (Ministry of Agriculture and Cooperatives). Compton, during his survey of the flora of Swaziland, collected a large number of plants which served as the foundation of this Herbarium. The National Herbarium is part of SABONET (Southern African Botanical Network; this is a GEF-funded project which aims to

electronically link-up all major herbaria in southern Africa and to provide support for modernising the storage of information at these herbaria via the use of appropriate computer database programmes). Funding for this programme officially ends in mid-2001.

Botanical gardens are an important form of *ex-situ* conservation, not only for the plants that are cultivated but also for the animals that are associated with those plants (such as insects and birds). At present, there are no botanical gardens in Swaziland, although there are plans to develop two such gardens (one in the newly created Mantenga Nature Reserve, and the second at Lobamba).

Considering the relatively large number of endemic plants (18 species), and the fact that many others are threatened with extinction (see section 2.3), the development of *ex-situ* conservation measures to protect these species may be prudent. Botanical gardens provide this opportunity, and should be the preferred mode of *ex-situ* conservation for endemic and threatened plants.

### 3.7 Public Education and Awareness

This section has been taken from the Swaziland Environmental Action Plan (1997), and for further details the latter document should be consulted. Environmental Education in Swaziland began largely through the efforts of the Swaziland National Trust Commission, non-governmental organisations and individual initiatives. A National Environmental Education Programme (NEEP) was established in 1975 under the auspices of the SNTC at Mlilwane Game Reserve. The programme was largely designed for school children who visited the reserve, and consisted of a combination of interpretation and presentations, using visual aids and films. This programme is presently being coordinated from the SNTC Headquarters.

#### The formal education system

In the 1970s and 1980s Swaziland, assisted by USAID began developing its own primary school curricula, with environmental concerns being incorporated into some of the subjects.

At the tertiary level, the Department of Geography and Enviromental Planning (UNISWA) offers a course on Environmental Studies, while the Department of Biological Sciences has been offering a short course on Conservation Biology. At teacher training colleges (SCOT, VOCTIM) there are no courses on environment being offered, although some effort has been made to incorporate environmental issues into existing courses.

#### Non-formal environmental education

The National Environmental Education Programme (NEEP) is the Government's agency for creating environmental public awareness. The following are some of its current activities:

- Acting as facilitator and secretariat to the Environmental Education, Public Awareness and Participation Committee which comprises representatives from the Ministry of Education, private game reserves which conduct EE, Yonge Nawe and UNISWA. This committee is carrying out a coordinating, networking, and catalysing function for EE activities in the country (such as facilitating the "Clean and Beautiful Swaziland" Forum, a voluntary

association of representatives of government agencies, NGOs and private sector who work towards promoting better waste disposal, recycling, rehabilitation of eroded areas, reforestation, and appropriate legislation and education to bring about greater public participation in keeping Swaziland clean and beautiful).

- Operating three EE resources centres (Malolotja, Mlawula and Lobamba).
- Strengthening the capacity of the Curriculum Centre to incorporate EE into the formal education system through workshops for teachers and production of materials.

**Non-governmental organisations**

Yonge Nawe is a leading NGO working on EE. It was originally formed to establish and support school conservation clubs. Its functions have expanded to include the promotion of adult conservation clubs and EE workshops for a wide range of the community. It is assisting communities in some of their environmental projects. In addition, it produces and distributes some EE materials.

There is an increasing number of NGOs (other than Yonge Nawe) which are now promoting EE. Among these are Big Game Parks, Emanti Esive, Family Life Association, the Swaziland Farmers Development Foundation, Umbuluzi Catchment Association, the Natural History Society of Swaziland, the Conservation Trust of Swaziland, and the Green Cross.

**The media**

Radio is widely used in Swaziland, and presently, through free time allocated to line ministries and NGOs, is being used to raise public environmental awareness. Newspaper space and TV time is expensive and till now has not been used systematically. The Swazi Times introduced a weekly Environmental Page (which appeared on Saturdays), but this has now been abandoned.

# 4.0 Strategy and action plan

## 4.1 Subtrategies for biodiversity conservation through the improvement of the protected areas network

**Goal**

A viable set of representative samples of Swaziland's full range of natural ecosystems are conserved through a network of protected areas.

**Obstacles and hindrances**

There are numerous obstacles currently preventing the realisation of this goal. The major obstacles are as follows:

1. None of the four ecosystems of Swaziland reach the IUCN's recommended 10% protection, while three of them (grassland, forest and aquatic) have only 2% within protected areas.
2. No recent field-based survey of protection worthy areas by ecosystem (and with the use of biodiversity criteria) have been conducted.
3. There are insufficient links (i.e. corridors) between ecosystems in different protected areas.
4. Threatened species of fauna and flora (i.e. those listed in Red Data Books) require special intervention to prevent their extinction.
5. Protected areas are threatened by alien plant invasion.
6. The protected area network is managed by two separate (non-communicating) authorities.
7. Funding for the management of protected areas is inadequate.
8. Due to insufficient socio-economic incentives, neighbouring communities often do not support protected areas.

**Substrategies**

The following substrategies have been formulated to address the obstacles presented above.

*Substrategy 1*

Modify existing protected areas network to protect 10% of the full range of ecosystems (addresses obstacles 1, 2 & 3).

Priority actions

- Conduct a Gap Analysis. This requires an updated map of the ecosystems of Swaziland reflecting areas converted to other forms of use, areas under protection, areas which are protection worthy, and areas which could potentially fall under community-based natural resource management. Protection worthy areas need to be assessed, classified and ranked (using IUCN criteria) based on field inventories.
- Use information arising from the Gap Analysis to develop criteria and processes to amend existing protected areas network. The involvement of landowners, stakeholders, local communities and other affected parties in the participatory process will be crucial to its success.

*Substrategy 2*
Adequately protect threatened and endemic species (addresses obstacle 4).

Priority actions
- Identify threatened species using internationally accepted criteria. This must be a dynamic process i.e. the lists of threatened species need to be regularly updated.
- Publish National Red Data Books. Currently, Red Data Books are being drafted for the vertebrates and for the flora. The publication and distribution of these books must be supported and extended to other taxa.
- Provide endangered species with legal protection. An endangered species clause needs to be developed, within the proposed Biodiversity Act (see section 8), to provide legal protection to endangered species.
- Enforce commitment to CITES and ratify the Lusaka Agreement. The policing of trade in endangered species may be conducted in conjunction with TRAFFIC and the Regional Task Force through the establishment of a National Bureau.
- Explore the possibility of signing other regional or international conventions which may assist in protecting endangered species within Swaziland.
- Provide *ex-situ* conservation for endemic, threatened and high-utility plant species through the establishment of a botanical garden (or a network of gardens). Mantenga Nature Reserve has been identified as an appropriate site for a botanical garden, but this needs to be supported (both administratively and financially) and followed through.

*Substrategy 3*
Minimise the impact of alien invasive species (addresses obstacle 5).

Priority actions
- Incorporate control measures of alien invasives into the management of plan of each protected area.
- Conduct a national assessment of, and develop cost effective control techniques for, alien invasives.

*Substrategy 4*
Improve the coordination and cooperation between all protected areas managers (addresses obstacle 6).

Priority actions
- Establishment of an Annual Biodiversity Conference as a forum for reporting, discussing and evaluating the management of protected areas. The establishment of this conference to be overseen by the SEA.

*Substrategy 5*
Assure adequate funding for management of protected areas (addresses obstacle 7).

Priority actions

- Amend fees structure according to professional analysis of market value for entrance fees, lodging and guide fees.
- Investigate the possibility of income from tax levy's on certain goods and services.
- Investigate the possibility of short- to long-term leasing options in protected areas.

*Substrategy 6*

Create socio-economic incentives that lead to local community support for protected areas conservation (addresses obstacle 8).

Priority actions

- Share entrance gate fees with structured community groups or representatives.
- Negotiate special provisions for neighbouring communities, such as limited extraction of resources and ceremonial uses.
- Provide for an official advisory role in management of protected areas by local communities.
- Develop eco-tourism to provide maximum benefits to local communities (e.g. by drawing on local human resources).

### 4.2 Subtrategies for sustainable use, and equitable sharing, of biological resources

**Goal**

Biological resources of natural ecosystems outside of the protected areas network are used sustainably.

**Obstacles and hindrances**

Major obstacles preventing the realization of this goal are as follows:

9. Resource users within local communities do not have exclusive rights to manage their biological resources.
10. Limited natural resource management systems are in place to ensure sustainable utilisation of biological resources.
11. Lack of law enforcement (pertaining to biodiversity issues) on SNL.
12. No laws and/or mechanisms in place to protect the intellectual property rights of Swaziland, local communities and individuals with respect to biodiversity resources.
13. Due to the above problems, biodiversity on SNL has already been greatly eroded.
14. Limited institutional and human capacity available to manage natural resource systems.

**Substrategies**

The long-term objective is to put in place an institutional, legal and policy framework and support mechanisms to enable local communities to sustainably manage their biological resources. Community-based natural resources management (CBNRM) presents one of the best opportunities for linking enterprise development with conservation of biodiversity. Natural resource management systems that generate benefits for community members and for the community as a whole can create economic incentives for conserving the resource. CBNRM is one of the most promising approaches for sustainable use of biological resources in Africa (Hagen, 1999). The greatest successes have been in community-based wildlife management in southern Africa and community-based natural savanna management in West Africa. The following guidelines have been synthesised from various countries throughout Africa which have been successful or promising in the development of CBNRM (Hagen, 1999). Successful CBNRM is based on:

- The voluntary association of people with traditional rights or common interests in natural resources management.
- Clearly defined limits of the community's resources that are recognised by all, especially by the communities neighbours and by government authorities.
- Recognised legal status for the community management structures.
- Legal instruments (and simple administrative procedures) for the transfer of natural resources management rights to communities.
- Exclusive rights for the community over the natural resources they manage.
- Principles of good governance in the form of a representative community institutional structure and equitable sharing of benefits from CBNRM.
- Mid- to long-term guarantees of management rights commensurate with the nature of the resource to be managed.

- Sustainable management of the natural resources.
- Development of institutional capacity for the community.
- Generation of revenue flows that: generate benefits for the community as well as for individuals; cover management costs; and generate tax for government structures.

These guidelines need to be tested and improved in order to successfully develop community-based sustainable management of biological resources in Swaziland. In order to achieve this, the following short-term substrategies have been formulated.

*Substrategy 1*
Test viable CBNRM and develop across all ecosystems (addresses obstacles 1 to 5).

Priority actions
- Review literature and investigate CBNRM projects which have been successful or show promise in other African countries.
- Identify communities in Swaziland with highest probability of successful initiation of CBNRM. The following criteria could be of use in the assessment procedure: are biological resources still in place? Is there a lack of internal conflict (e.g. chieftaincy dispute) within the community? Are community members motivated? Is there a ready market for the products to be managed?
- Develop pilot projects in each of the four ecosystems, namely grassland, savanna, forest and aquatic.

*Substrategy 2*
Enact CBNRM-enabling legislation based on results of pilot projects (addresses obstacle 4).

Priority actions
- Formal participatory review and evaluation of pilot projects.
- Draft appropriate legislation.

*Substrategy 3*
Develop institutional capacity and human resources to support CBNRM (addresses obstacle 6).

Priority action
- Identify important institutions and analyze human resources needs.
- Determine the levels of sustainable use for different resources.

*Substrategy 4*
Develop laws and support mechanisms to protect intellectual property rights of Swaziland, local communities and individuals (addresses obstacle 4).

Priority actions
- Monitor bioprospecting activities in Swaziland.

- Based on this monitoring, review and draft appropriate legislation.
- Assign institutional mandate to SEA to oversee this process.

*Substrategy 5*
Identify biodiversity components that can be marketable on a nation-wide scale (addresses obstacle 2).

Priority actions
- Support current research on medicinal and food plants being conducted at UNISWA.
- Encourage research on other components of biodiversity in Swaziland.
- Develop expertise in resource economics and biodiversity valuation.

### 4.3 Subtrategies for the conservation of agro-biodiversity

**Goal**

The genetic base of Swaziland's crops and livestock breeds is efficiently conserved.

**Strengths**

As outlined in section 3.2 (above), the conservation of agro-biodiversity is currently being aggressively pursued by the Ministry of Agriculture and Cooperatives. Separate units have been established to handle plant genetic material and farm animals. These two units are currently operating efficiently and are producing positive results. This is a great strength to achieving the goal (above).

**Obstacles and hindrances**

Obstacles preventing the realization of this goal are as follows:

15. Indigenous crops are threatened by the use of hybrids and high yielding varieties.
16. Populations of wild crop relatives are being eradicated through habitat loss.
17. Indigenous livestock breeds are threatened through indiscriminate breeding with exotic breeds.
18. Loss of genetic viability within livestock breeds through inbreeding due to lack of appropriate breeding policies and programmes.
19. Inadequate research and information available on indigenous crops and livestock.

**Substrategies**

The following substrategies have been formulated to address the obstacles presented above.

*Substrategy 1*

Conserve, and sustainably use, plant genetic resources (addresses obstacles 3 to 5).

Priority actions

- Identify plant genetic resources of relevance to agriculture (i.e. crop plants and crop relatives).
- Collect and conserve, using modern technology, genetic resources of crop plants and crop relatives. This task is currently being undertaken by the Gene Bank at Malkerns Research Station (Ministry of Agriculture and Cooperatives).
- Curate plant genetic resources information in a format compatible with the NBDU.

*Substrategy 2*

Conserve, and sustainably use, farm animal genetic resources (addresses obstacles 1,2 & 5).

Priority actions

- Characterize and database farm animal genetic diversity in Swaziland.
- Identify special characteristics of farm animals that need preservation.
- Develop breeding programmes which result in the sustainable utilisation of the genetic characteristics of the animals identified.

- Curate farm animal genetic resources information in a format compatible with the NBDU.

### 4.4 Subtrategies for biosafety

**Goal**

Risks associated with the use of living, modified organisms (LMOs) in Swaziland are minimized.

**Obstacles and hindrances**

A number of problems have been identified which currently hinder the realization of the goal:

20. Institutional structure not yet identified to oversee all aspects of use of LMOs in Swaziland.
21. No legal or policy framework exists to reduce the risks associated with the use of LMOs.
22. Human resources inadequate to assess, and deal with, these risks.
23. Records of LMOs currently in use in Swaziland are not available.

**Substrategies**

The following substrategies have been formulated to address the obstacles presented above.

*Substrategy 1*

Identify an institution responsible for overseeing all aspects of the use of LMOs (addresses obstacle 1).

Priority actions

- SEA to host a national workshop at which stakeholders will discuss and agree on the most suitable institution to be responsible for overseeing all LMO issues.

*Substrategy 2*

Develop legal and policy framework for the controlled use of LMOs (addresses obstacle 2).

Priority actions

- SEA to seek appropriate funding for the development of a legal and policy framework relating to the minimisation of risks associated with the use of LMOs.

*Substrategy 3*

Develop human expertise in the field of the use of LMOs (addresses obstacle 3).

Priority actions

- SEA to seek appropriate funding for an assessment with respect to human resources needs in the field of LMO control and use.
- Develop human resources in critical areas by way of staff training and recruitment.

*Substrategy 4*

Research into vital actions necessary to minimize risk of LMOs (addresses obstacle 4).

Priority actions

- Inventory LMOs currently in use in Swaziland.

- Ratify the Biosafety Protocol.

### 4.5 Subtrategies for improving the institutional and legal frameworks and the human resources for conservation and sustainable use

**Goal**

The institutional, policy and legal frameworks, as well as the human resources needed to implement the Biodiversity Strategy and Action Plan, are developed.

**Obstacles and hindrances**

24. The laws dealing with biodiversity issues are fragmented and do not fully cover all aspects.
25. Limited institutional structure currently exists for wildlife management outside of protected areas (especially on SNL).
26. Limited coordination of activities of existing institutional structures responsible for biodiversity management.
27. Limited institutional structures exist in local communities (on SNL) for the explicit purpose of managing biological resources.
28. Limited institutions currently in place to develop human resources of local communities to enable them to establish their own management structures for community-based natural resources management (CBNRM).
29. Inadequate human resources or expertise to deal with certain biodiversity issues, especially in the fields of systematics, resource economists, environmental law, biotechnology and CBNRM.
30. No single national body currently charged with the task of collecting, storing and managing biodiversity at the national scale.
31. Illegal harvesting of biological resources in protected areas is not under control.

**Substrategies**

The following substrategies have been formulated to address the obstacles presented above.

*Substrategy 1*

Strengthen legislation pertaining to biodiversity conservation (addresses obstacle 1).

Priority actions.

- Develop a new, all-encompassing Wildlife Act, with corresponding regulations and guidelines, for the protection and management of biodiversity in Swaziland which would harmonize existing legislation which would be enfolded in the new Act (including the Flora Protection Act, the SNTC Act, the Game Act, etc).
- Develop legislation for effective Community-based Natural Resource Management (CBNRM) (see section 5).

*Substrategy 2*

Identify institutions responsible for developing CBNRM (addresses obstacle 2).

Priority actions

- SEA to establish a task team to review the institutional framework required to support CBNRM.
- The above-mentioned task team to review the needs of local communities to enable them to establish CBNRM.

*Substrategy 3*
Clearly define the roles and responsibilities of the various government institutions, NGOs, parastatals and private bodies responsible for the management of biodiversity (addresses obstacles 3 & 4).

Priority actions
- Identify and formalise the roles and responsibilities of the various government institutions, NGOs, parastatals and private bodies responsible for the management of biodiversity in Swaziland.
- Make TDL property owners responsible for biodiversity management on their properties in accordance with nationally prescribed laws and regulations.
- Give SEA the overall responsibility of coordinating the management of biodiversity in Swaziland.
- Formalise linkages between SNTC, Forestry Department (MOAC), the Herbarium (MOAC), Genebank (MOAC) and other institutions (public or otherwise) which are directly responsible for managing biodiversity within Swaziland.

*Substrategy 4*
Develop human resources to deal with all aspects of biodiversity, by the promotion of higher levels of training in relevant fields (addresses obstacles 5 & 6).

Priority actions
- Review and upgrade relevant undergraduate programmes to include biodiversity-related courses.
- Establish postgraduate training in biodiversity conservation and development.
- Solicit and access financial assistance for training in taxonomy and biodiversity conservation.
- Encourage and promote research that is relevant to biodiversity conservation.
- Develop expertise in resource economics and biodiversity valuation.

*Substrategy 5*
Provide easily accessible and up-to-date biodiversity information through storage of information in a central facility (addresses obstacle 7).

Priority actions
- Establish a National Biodiversity Database Unit (NBDU) to be responsible for the curation and storage of all biodiversity information related to Swaziland. The NBDU will require at least two fast computers with large hard-drives, appropriate database and GIS programmes, and an adequate back up system. Biodiversity information will be obtained from various sources including the literature and directly from researchers. The collection of biodiversity

information (such as species occurrence and distribution; description and functioning of ecosystems; threats to biodiversity; etc) will be coordinated by the NBDU.
- Provide training for the curators. The NBDU will require curators to manage the data. These curators will require appropriate training in biodiversity information management.
- Develop guidelines for access to biodiversity information. Regulations regarding the dissemination of biodiversity information in the NBDU need to be drafted.

*Substrategy 6*

Control illegal harvesting of biological resources through enhanced law-enforcement (addresses obstacle 8).

Priority actions

- Train potential law-enforcement agents e.g. rangers and extension officers.
- Involve Interpol in curbing illegal export of biodiversity components.
- Establish a national law-enforcing unit which would be mobile and move between protected areas.
- Bring to the attention of the Law Society of Swaziland the backlog of "poaching" cases in the courts of law.

### 4.6 Subtrategies for enhancing public awareness of the value of, and need for, biodiversity conservation

**Goal**

Public awareness of, and support for, biodiversity conservation in Swaziland is enhanced.

**Obstacles and hindrances**

The major obstacle preventing the realization of this goal is as follows:

- The general public does not fully realise the value of biodiversity to humanity, and is not aware of the impending loss of biodiversity in Swaziland.

**Substrategies**

The following substrategies have been formulated to address the obstacles presented above.

*Substrategy 1*

Raise public awareness on biodiversity issues (addresses obstacle 1).

Priority actions

- Introduce biodiversity topics across curricula. Biodiversity topics should be integrated, in a holistic fashion, into all relevant subjects at primary, secondary and tertiary (especially teacher training institutes) levels.
- Incorporate updated biodiversity topics into ongoing Environmental Education Programmes.
- Enhance the value of existing environmental radio programmes by including biodiversity awareness topics (especially those of a development-oriented nature).
- Explore and exploit other systems of communication such as written material and documentaries.
- Open and encourage two-way channels of communication for inputs from grassroots, communities and the general public.
- Indigenous knowledge of biodiversity must be captured, document and stored in the NBDU (National Biodiversity Database Unit).
- Encourage extra-curricula activities related to biodiversity in schools.
- Run seminars and workshops for educators, policy makers (both modern and traditional), media personnel, engineering concerns (such as construction companies, Ministry of Works and Construction), the private sector and communities.
- Promote and strengthen the use of environmental education centres, especially for secondary, tertiary and adult groups.

**Table 4.1** Summary of the priority actions of the Swaziland Biodiversity Strategy and Action Plan. Blank cells in the "Funding" or "Project status" columns indicate that, for that particular action, there is currently no funding available and that no project has as yet been proposed, respectively. The time-frame terms represent following approximate periods; short-term: 1-3 years, medium-term: 2-5 years, long-term: 5-10 years.

| Priority actions | Implementing institution | Time-frame | Funding | Project status |
|---|---|---|---|---|
| **BIODIVERSITY CONSERVATION THROUGH THE IMPROVEMENT OF THE PROTECTED AREAS (PA) NETWORK** | | | | |
| Conduct a GAP Analysis | SNTC | short-term | possible funding | proposed |
| Using GAP analysis develop criteria and proccesses to amend existing PA network | SNTC | medium-term | | |
| Identify threatened species | NBDU, SNTC | short-term | | ongoing |
| Provide endangered species with legal protection | SEA, SNTC | medium-term | | |
| Enforce commitment to CITES and ratify Lusaka Agreement | SNTC, Big Game Parks | medium-term | | |
| Explore possibility of signing other relevant conventions | SEA, SNTC | short-term | | |
| Establish a botanical garden at Mantenga Nature Reserve | SNTC | medium-term | | proposed |
| Incorporate control measures of alien invasives into the management plan of each PA | SNTC, MOAC, Private | medium-term | | |
| Conduct a national assessment of alien invasives and develop control measures | SNTC, NBDU | medium-term | | |
| Establish an Annual Biodiversity Conference | SNTC, SEA | continuous | possible funding | proposed |
| Amend fees structure for PAs according market analysis | SNTC | medium-term | | |
| Investigate possibility of income from tax levy's | SEA | medium-term | | |
| Investigate possibility of short- to long-term leasing options in PAs | SNTC | medium-term | | |
| Share PA gate fees with structured community groups | SNTC, Big Game Parks | medium-term | | |
| Negotiate special provisions for communities neighbouring PAs | SNTC, Big Game Parks | medium-term | | |
| Provide for an advisory role in management of PAs by local communities | SNTC, Big Game Parks | medium-term | | |
| Develop eco-tourism to provide maximum benefits to local communities | SNTC, Big Game Parks | medium-term | | |
| **SUSTAINABLE USE, AND EQUITABLE SHARING, OF BIOLOGICAL RESOURCES** | | | | |

| | | | | |
|---|---|---|---|---|
| Review literature and investigate CBNRM projects which have been successful or show promise in other African countries | SNTC, SEA | short-term | | |
| Identify communities in Swaziland with highest probability of successful initiation of CBNRM. | SNTC | short-term | | |
| Develop pilot projects in each of the four ecosystems | SNTC, MOAC | medium-term | | |
| Formal participatory review and evaluation of pilot projects | SNTC, SEA | medium-term | | |
| Draft appropriate legislation | SNTC, SEA | long-term | | |
| Identify important institutions and analyze human resources needs | SNTC, SEA | long-term | | |
| Determine levels of sustainable use for resources | SNTC, NBDU | | | |
| Monitor bioprospecting activities in Swaziland | SEA | short-term | | |
| Based on this monitoring, review and draft appropriate legislation | SEA | medium-term | | |
| Assign institutional mandate to SEA to oversee this process | SEA | short-term | | |
| **CONSERVATION OF AGRO-BIODIVERSITY** | | | | |
| Identify plant genetic resources of relevance to agriculture (i.e. crop plants and crop relatives) | Gene Bank | short-term | | |
| Collect and conserve, using modern technology, genetic resources of crop plants and crop relatives | Gene Bank | medium-term | funded | ongoing |
| Curate plant genetic resources information in a format compatible with the NBDU | Gene Bank, NBDU | short-term | | |
| Characterize and database farm animal genetic diversity in Swaziland | MOAC | short-term | funded | ongoing |
| Identify special characteristics of farm animals that need preservation | MOAC | medium-term | | |
| Develop breeding programmes which result in the sustainable utilisation of the genetic characteristics of the animals identified | MOAC | long-term | | |
| Curate farm animal genetic resources information in a format compatible with the NBDU | MOAC, NBDU | short-term | | |
| **BIOSAFETY** | | | | |
| SEA to host a national workshop at which stakeholders will discuss and agree on the most suitable institution to be responsible for overseeing all LMO issues | SEA | short-term | | |
| SEA to seek appropriate funding for the development of a legal and policy framework relating to the minimisation of risks associated with the use of LMOs | SEA | short-term | possible funding | proposed |
| SEA to seek appropriate funding for an assessment with respect to human resources needs in the field of LMO control and use | SEA | short-term | | |

| | | | | |
|---|---|---|---|---|
| Develop human resources in critical areas by way of staff training and recruitment | SEA, UNISWA | medium-term | | |
| Inventory LMOs currently in use in Swaziland | SEA, UNISWA | | | |
| Ratify Biosafety Protocol | SEA | | | |
| **IMPROVING INSTITUTIONAL AND LEGAL FRAMEWORKS AND HUMAN RESOURCES** | | | | |
| Develop a new, all-encompassing Wildlife Act, with corresponding regulations and guidelines, for the protection and management of biodiversity in Swaziland | SEA | long-term | | |
| Develop legislation for effective CBNRM | SNTC, SEA | long-term | | |
| SEA to establish a task team to review the institutional framework required to support CBNRM | SEA, SNTC | short-term | | |
| The above-mentioned task team to review the needs of local communities to enable them to establish CBNRM | SNTC, SEA | long-term | | |
| Identify and formalise the roles and responsibilities of the various government institutions, NGOs, parastatals and private bodies responsible for the management of biodiversity in Swaziland | SEA | medium-term | | |
| Make TDL property owners responsible for biodiversity management on their properties in accordance with nationally prescribed laws and regulations | SEA | medium-term | | |
| Give SEA the overall responsibility of coordinating the management of biodiversity in Swaziland | SEA | medium-term | | |
| Formalise linkages between SNTC, Forestry Department (MOAC), the Herbarium (MOAC), Genebank (MOAC) and other institutions (public or otherwise) which are directly responsible for managing biodiversity within Swaziland | SEA | medium-term | | |
| Review and upgrade relevant undergraduate programmes to include biodiversity-related courses | UNISWA | short-term | | |
| Establish postgraduate training in biodiversity conservation and development | UNISWA | medium-term | | |
| Solicit and access financial assistance for training in taxonomy and biodiversity conservation | SEA, UNISWA | medium-term | | |
| Encourage and promote research that is relevant to biodiversity conservation | NBDU | medium-term | | |
| Establish a National Biodiversity Database Unit (NBDU) to be responsible for the curation and storage of all biodiversity information related to Swaziland | SEA | short-term | partial funding | ongoing |
| Provide training for NBDU curators | SEA, UNISWA | continuous | partial funding | ongoing |
| Develop guidelines for access to biodiversity information | NBDU, SEA | short-term | | |
| Train potential law-enforcement agents | SNTC | | | |
| Involve Interpol in curbing illegal export of biodiversity | SNTC | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| Establish a mobile national law-enforcing unit | SNTC | | | |
| Bring to attention of Law Society backlog of poaching cases | SNTC | | | |
| **ENHANCING PUBLIC AWARENESS OF THE VALUE OF, AND NEED FOR, BIODIVERSITY CONSERVATION** | | | | |
| Introduce biodiversity topics across curricula | NEEP, SEA | medium-term | | |
| Incorporate updated biodiversity topics into ongoing Environmental Education Programmes | NEEP | short-term | | |
| Enhance the value of existing environmental radio programmes by including biodiversity awareness topics | NEEP | medium-term | | |
| Explore and exploit other systems of communication such as written material and documentaries | NEEP | medium-term | | |
| Open and encourage two-way channels of communication for inputs from grassroots, communities and the general public | NEEP | medium-term | | |
| Indigenous knowledge of biodiversity must be captured, document and stored in the NBDU | NBDU | medium-term | | |
| Encourage extra-curricula activities related to biodiversity in schools | NEEP | medium-term | | |
| Run seminars and workshops for educators, policy makers, media personnel, engineering concerns, the private sector and communities | NEEP | medium-term | | |

# 5.0 Implementation of BSAP

Strategies and action plans are relatively easy to write up. Without their implementation, however, these plans are of little value. The Swaziland Environment Action Plan (1997) recognised the fact that, in African countries, implementation of strategies have often fallen behind the target. The main reasons given for this were: unusually high targets; lack of cooperation between institutions; lack of participation by local resource users; lack of political will and/or political instability; inadequate financing; lack of regional and international collaboration and support.

Three actions were identified by SEAP that would improve the implementation of SEAP objectives:

- The development of partnerships between the various implementing institutions (including the private sector, and community/local and regional administrations).
- The use of policy instruments including economic policy instruments and non-fiscal policy instruments such as Environmental Impact Assessments (EIA).
- The monitoring of SEAP policies and strategies in order to provide feedback on progress with respect to objectives.

For further details on this subject see the SEAP document.

**5.1 Funding**

Appropriate funding will be crucial to the implementation of BSAP. The SEAP document identified three potential sources of funding which are summarised below.

*External sources*

Funding from foreign donors needs to be explored. The Global Environment Authority (GEF), which funded the development of this BSAP document, funds biodiversity projects of global significance. Since the biodiversity of Swaziland does have global significance, funding from the GEF is a possibility.

Other external sources could include bilateral grants from “developed” countries or loans from the World Bank (WB).

*National sources*

Various potential sources of funding exist from National sources including the Government of Swaziland (GOS), the private sector and the NGO community. Indeed, funding from the GOS is essential as this would indicate commitment on the part of the government.

*National Environment Fund*

A National Environment Fund (NEF) for Swaziland has been planned and is envisaged to become operational in due course. The purpose of this fund would be to support environmental protection initiatives in the country. The donor community has indicated its willingness to support this fund on the basis that the GOS makes the initial contribution. Most BSAP initiatives would almost certainly

be eligible for funding from the NEF. For more information on the NEF see the SEAP document.

### 5.2 Relationship with SEAP

The Biodiversity Strategy and Action Plan does not stand alone, but is an integral part of the SEAP process. SEAP identifies five major programme areas one of which is the "Management and use of biodiversity". The primary goal of this programme area is to formulate and implement a National Biodiversity Strategy and Action Plan. Thus the BSAP process is rooted in the SEAP process and cannot be viewed in isolation.

### 5.3 Role of the Biodiversity Steering Committee

A Biodiversity Programme Implementation Committee has already been selected to initiate the SEAP "management and use of biodiversity)" programme area. The main objective of this committee will be to oversee the implementation of BSAP. As most members of this committee would have been involved with the formulation of BSAP, there will be continuity in the process (without which history and experience are lost).

As the implementation of BSAP will require a large amount of administrative work, it is suggested that the SEA recruit a BSAP Implementation Officer (or Biodiversity Officer) responsible to the Director.

### 5.4 Involvement in regional initiatives

There are currently two major regional (cross-border) initiatives which concern Swaziland, namely: the Maputo Development Corridor, and the Lubombo Spatial Development Initiative. Both these initiatives include the involvement of the Governments of Mocambique, South Africa and Swaziland, and are being planned as an agro-tourism investment zone. The development strategy is designed to promote coordinated private and state sector investment in focussed areas of these three countries that can become an integrated zone for vibrant new industries, especially in the fields of ecotourism and agriculture. These two initiatives provide an exceptional opportunity for the implementation of BSAP, which should not be squandered. Furthermore, as these two initiatives combined cover a large (and topographically diverse) area of the country, implementation of projects within these areas should have a significant impact on biodiversity conservation in Swaziland as a whole.

### 5.5 Convention to Combat Desertification

The Convention to Combat Desertification (CCD) at this stage is probably the most important convention affecting the implementation of BSAP. Many of the goals and identified projects of the CCD support the conservation of biodiversity in general, and the implementation of BSAP, specifically. Desertification is defined as the degradation of land especially in arid, semi-arid or dry sub-humid climatic regions as a result of human and climatic processes. Currently, it is estimated that more than half of all communal grazing land in Swaziland is seriously or very seriously eroded. In response to this threat Swaziland has engaged in a number of programmes and projects to combat desertification, details of which may be found in Downing & Zuke (1996) and Fakudze & Mlipha (1998). Most of these projects revolve around improving the status of grazing lands and since the degradation of the landscape has been identified as a major threat to Swaziland's biodiversity, these

projects will also assist the process of biodiversity conservation. Also considering the poor state of the economy and associated dearth of funds, closer cooperation between BSAP and CCD will be imperative to successful implementation of both processes.

# 6.0 Monitoring and Evaluation

Monitoring progress is vital to the BSAP process. The SEAP document has discussed relevant indicators and monitoring systems for that process. These will not be repeated again here. Presented below are steps for monitoring the BSAP processes only. However, since the BSAP and SEAP processes are interconnected (see Chapter 10.0, above), the monitoring outlined below should be seen as part of the overall SEAP monitoring process and not in isolation.

There are in fact two separate issues that require monitoring. The first is the BSAP implementation process itself. In other words, is BSAP being implemented according to the plan? The second is the state of Swaziland's biodiversity. In other words, is the implementation of BSAP improving the conservation status of Swaziland's biodiversity? The distinction is important. By way of example, the BSAP implementation process may be proceeding according to plan, but the erosion of biodiversity could still be increasing.

**Monitoring the BSAP process**
Monitoring the progress of BSAP should be a relatively simple process. The priority actions identified by BSAP have been defined as clearly as possible (including the provision of a time-frame) so as to allow easy assessment of progress. The Biodiversity Implementation Committee should review the progress of BSAP on a regular basis. The responsibility of actual monitoring would fall on the Biodiversity Officer (SEA).

**Monitoring the conservation status of biodiversity**
Monitoring the state of biodiversity in Swaziland is a less simple task. For a start, information on biodiversity in Swaziland is patchy and incomplete (see Chapter 2.0). The high levels of biodiversity, combined with a shortage of local technical expertise, limit the quantity and quality of any monitoring exercise. A common solution is the use of indicators. Indicators express information, collected from a complex system, in a simplified form. Three broad categories of indicators have been identified as suitable for the monitoring of SEAP: 1) socio-economic indicators; 2) environmental indicators; and 3) indicators of sustainable development (for further details see the SEAP document). Relevant indicators of the state of biodiversity need to be developed for Swaziland.

In the Swaziland context, the following groups could potentially serve as indicators of biodiversity: state of the vegetation; macro-invertebrates (aquatic systems); birds (aquatic and terrestrail systems); and possibly frogs (aquatic systems). This does not imply that other groups are unsuitable as indicators, but rather that their potential has not yet been explored. In addition to the above-mentioned groups, endangered or endemic species of organisms could also act as indicators.

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# ANNEX 1: contributors to the development of BSAP

***THE BSAP STEERING COMMITTEE***

*Mr. J.D. Vilakati, Swaziland Environment Authority
*Mr. S. Zuke, Swaziland Environment Authority
Mr. R. Boycott, Swaziland National Trust Commission
Mr. B. Davies, Swaziland Environment Authority
Mr. C. Dlamini, Ministry of Agriculture and Cooperatives
*Ms. D. N. Dlamini, Swaziland National Trust Commission
Mr. S. Dlamini, Mbuluzi Nature Reserve
Mrs. D. Earnshaw, University of Swaziland
*Dr. P. N. Fakudze, University of Swaziland
Ms. Z. Hlatjwayo, Swaziland Environment Authority
Mr. K. P. Khumalo, University of Swaziland
Mr. R. Kirker, Natural History Society
*Dr. I. S. Kunene, University of Swaziland
Mr. A.D. Langa, Swaziland Traditional Healers Association
*Mrs T. Lupupa, Malkerns Research Station
Mr. F. Magagula, Ministry of Agriculture and Cooperatives
Mr T. A. Mahlaba, University of Swaziland
Ms. B. Makama, Yonge Nawe
Dr. G. T. Masina, University of Swaziland
Ms. P. Masson, SAPPI - Usuthu Pulp Company
*Mr. N. Matsebula, Ministry of Agriculture and Cooperatives
*Dr. A. Monadjem, University of Swaziland
*Dr. B. S. Nkosi, Swaziland Environment Authority/University of Swaziland
*Dr. I. Alan, Environmental Consultant

**Members of the BSAP Planning Team*

***THE BSAP TECHNICAL WORKING GROUPS***

**Group 1 - Data Collection and Storage**
Mr T. A. Mahlaba, University of Swaziland (Chairperson)
Dr. C. M. Magagula, University of Swaziland (Secretary)
Ms. K. Braun, Independant Consultant
Mr. F. Magagula, Ministry of Agriculture and Cooperatives
Mr. C. Saunders, Independant Consultant
Dr. I. S. Kunene, University of Swaziland
Mrs. L. Magagula - Gumbi, Swaziland National Trust Commission

**Group 2 - Biodiversity Education**
Ms. D. N. Dlamini, Swaziland National trust Commission
Ms. Z. Hlatjwayo, Swaziland Environment Authority
Mr. B. Thusi, Swaziland National Trust Commission
Mr. S. Nyembe, Swaziland National Trust Commission
Ms A. Reilly, Big Game Parks
Mr. F. Dlamini University of Swaziland (SSTA)
Prof. A. Sessay, University of Swaziland

**Group 3 - Ecotourism**
Mr. R. de Vletter, Mphophonyane Lodge (Chairperson)
Dr. J. Traill Thompson, Swaziland Environment Authority (Secretary)
Mr. M.V. Sithole, University of Swaziland
Mr. D. Raw, Big Game Parks

**Group 4 - Protection Worthy Areas and Endangered Species**
Ms. P. Masson, Usuthu Pulp Company (Chairperson)
Mr. R. Kirker, Natural History Society
Mr. K. Roques, Swaziland National Trust Commission
Dr. P.N. Fakudze, University of Swaziland
Mr. J. Nxumalo, Yonge Nawe
Mr M. Dlamini, Ministry of Agriculture and Cooperatives

**Group 5 - Legislation and Institutional Review**
Mr. G. T. Masina, University of Swaziland (Chairperson)
Mr S. Zuke, Swaziland Environment Authority
Mr R. Girdwood, Swaziland National Trust Commission
Mrs. T. Lupupa, Ministry of Agriculture (Malkerns Research Station)
Mr. B. Davies, Swaziland Environment Authority
Mr. R. Brown, Environment Consultancy Services
Mr. D. Ducasse, Ubombo Sugar
Mr. J. D. Vilakati, Swaziland Environment Authority

**Group 6 - Commercialization of Biodiversity Products**
Mr M. Mander, Institute of Natural Resources, Pietermaritzburg (Chairperson)
Mr. A.D. Langa, Swaziland Traditional Healers Association
Mr N. Maseko, Swaziland Traditional Healers Association
Mrs D. Earnshaw, University of Swaziland
Mr P. K. Khumalo, University of Swaziland

***SWAZILAND ENVIRONMENT AUTHORITY (STAFF)***

Mr. J. D. Vilakati, SEA Director
Mr. S. M. Zuke, Senior Environment Officer
Mr. B. Dlamini, Environmental Engineer
Mr. B. Davies, Overseas Development Advisor
Dr. J. Traill Thomson, Resource Economist
Ms. Z. Hlatjwayo, Information Officer
Ms. T. Zondi, Ozone Officer
Ms. P. Kumalo, Project Secretary
Mr. M. Mkhonta, Junior Clerk

***TECHNICAL ASSISTANCE***

**National Coordinators, BSAP Project:**
Dr. B. S. Nkosi, University of Swaziland (July 1997 - August 1998)
Dr. A. Monadjem, University of Swaziland (September 1998 - February 1999; and major revision in early 2001)

**Short-term National Consultants:**
Mrs. D. Earnshaw, University of Swaziland
Dr. P. N. Fakudze, University of Swaziland
Dr. I.S. Kunene, University of Swaziland
Mr P. K. Khumalo, University of Swaziland
Mr T.A. Mahlaba, University of Swaziland
Dr. G. T. Masina, University of Swaziland
Mr. V. M. Sithole, University of Swaziland
Dr. A. Monadjem, University of Swaziland
Mr. J. Nxumalo, Yonge Nawe
Mr.K. Roques, Swaziland National Trust Commission
Ms. L. Dobson, Environmental Consultant

**Regional Consultant:**
Mr M. Mander, Institute of Natural Resources, Pietermaritzburg, South Africa

**Short-Term International Consultants:**
Prof. I. R. Swingland, DICE University of Kent, United Kingdom
Dr. A. Rodgers, UNDP (GEF), Tanzania