Republic of South Africa

A LEVEL I RIVER ECOREGIONAL CLASSIFICATION SYSTEM FOR SOUTH AFRICA, LESOTHO AND SWAZILAND

Final

Department of Water Affairs and Forestry
Resource Quality Services

September 2005
Published by

Department of Water Affairs and Forestry
Resource Quality Services
Private Bag X313
PRETORIA
0001

Republic of South Africa
Tel: (012) 808 9500

_____________________________________________________

Copyright Reserved

_____________________________________________________

This publication may be reproduced only for non-commercial purposes and only after appropriate authorisation by the Department of Water Affairs and Forestry has been provided.

Additional copies can be requested from the above address.

No part of this publication may be reproduced in any manner without full acknowledgement of the source.

This document should be cited as:

FOREWORD

This document is the final revision of the delineation of Level I River Ecoregions for South Africa. It collates the opinions and knowledge of experts in various parts of South Africa and replaces the preliminary versions that appeared as part of the Resource Directed Measures (RDM) documentation of the Department of Water Affairs and Forestry (DWAF) (Kleynhans et al. 1998a; Kleynhans & Hill 1999).

Although the Level I River Ecoregions are broadly useful for identifying the main characteristics of major rivers, their foremost purpose is to serve as a basis for the more detailed Level II delineations.
ACKNOWLEDGEMENTS

The following people contributed to this report and are gratefully acknowledged:

Mr Jake Alletson  Alletson Ecologicals (KwaZulu Natal)
Mr Mick Angliss  Limpopo Department of Finance and Economic Development
(Northern part of South Africa)
Mr Ben Benade  Eko-Impak Environmental Consultants (Northern Cape)
Mr Anton Bok  Anton Bok Aquatic Consultants (Eastern Cape)
Dr Charlie Boucher  University of Stellenbosch (Cape Provinces)
Dr Cate Brown  Southern Waters (Southwestern- and Eastern Cape)
Mr Mike Coke  Private (KwaZulu Natal)
Dr Andrew Deacon  SANP (Kruger National Park)
Dr G.C.O. de Beer  Limpopo Department of Finance and Economic Development
(Northern part of South Africa)
Dr Chris Dickens  Umgeni Water (KwaZulu Natal)
Dr Evan Dollar  CSIR (Whole South Africa)
Dr Johan Engelbrecht  Mpumalanga Parks Board (Northern part of South Africa)
Mr P. Fouche  Limpopo Department of Finance and Economic Development
(Northern part of South Africa)
Prof Dennis Hughes  Rhodes University (Comments on draft document)
Ms Delana Louw  IWR Source-to-Sea (Comments on draft document)
Mr G. Nel  Limpopo Department of Finance and Economic Development
(Northern part of South Africa)
Prof Jay O’Keeffe  Rhodes University (Comments on draft document)
Dr Rob Palmer  AfriDev Associates (Whole South Africa)
Mr Stan Rodgers  Limpopo Department of Finance and Economic Development
(Northern part of South Africa)
Dr Dirk Roux  CSIR (Comments on draft document)
Prof Kate Rowntree  Rhodes University (Eastern Cape)
Dr Mandy Uys  Laughing Waters (Eastern Cape)
Dr Freek Venter  SANP (Kruger National Park)
Dr Roy Wadeson  IWR Environmental (KwaZulu Natal)

The following DWAF staff are thanked for reviewing the document:
Mr M.P. Nepfumbada
Dr. Q Espey
Mr B Madikizela
SUMMARY

The rationale and fundamentals of the ecoregional typing of rivers entail the following:

- Chapter 3 of the National Water Act (NWA) of South Africa (Act No. 36 of 1998) refers specifically to the protection of the ecological reserve to realise long-term sustainable development.

- Chapter 14 of the NWA deals, amongst other aspects, with water resource monitoring and assessment.

- To enable the realisation of the protection and monitoring of the ecological reserve, it follows that the resource must be ecologically delineated and Resource Quality Objectives specified for various ecological components within this delineation.

South Africa is a geologically, geomorphologically, climatically and ecologically complex country, and this results in a diverse range of ecosystems, including rivers. River ecoregional classification or typing will allow the grouping of rivers according to similarities based on a top-down nested hierarchy. The purpose is to simplify and contextualise assessments and statements on ecological water requirements. One of the advantages of such a system is the extrapolation of information from data rich rivers to data poor rivers within the same hierarchical typing context. To realise the delineation of various river types within an ecological context it was decided to follow the ecoregional typing approach developed by Omernik (1987). This approach is presently applied by the USEPA as a framework for the formulation of reference conditions and to set resource quality specifications.

- Ecoregions can be identified or typed on the basis of various levels of detail. The principle of river typing is that rivers grouped together at a particular level of the typing hierarchy will be more similar to one another than to rivers in other groups.

- An ecosystems approach recognizes that ecosystem components do not function as independent systems but that they exist only in association with one another.

- Ecosystems and their components display regional patterns that are reflected in spatially variable combinations of causal factors such as climate, mineral availability (soils and geology), vegetation and physiography. These factors interact, but the importance of each factor in determining the character of ecosystems varies from place to place.
Omernik's (1987) approach is based on patterns of terrestrial characteristics and on the premise that relatively homogenous areas exist and that these areas can be defined by simultaneously analysing a combination of causal and integrative factors. In this approach, ecoregions are regions of relative homogeneity in ecological characteristics or in relationships between organisms and their environments.

Ecoregional classification uses multiple characteristics at each level of a typing hierarchy. Ecological regions are, then, regions within which there is relative similarity in the mosaic of ecosystems and ecosystem components (biotic and abiotic, aquatic and terrestrial).

The delineation of ecological regions requires evaluating maps of all geographic phenomena believed to cause or reflect spatial differences in ecosystems. Where combinations of these phenomena coincide spatially, the ecosystems are likely to be similar. The process requires qualitative examination to account for the differences in generality, accuracy, and particular classifications of each map. The regions are essentially sketched (Omernik 1995; Omernik pers. comm. 1998), using expert judgement to delineate boundaries.

Ecoregional classification is a hierarchical procedure that involves the delineation of ecoregions with a progressive increase in detail at each higher level of the hierarchy, i.e. essentially the same characteristics are used at the various levels but with more detail as one moves to a higher level in the hierarchy. In addition, the characteristics that are more or less important can vary from one place to another.

It must be emphasized that although several terrestrial characteristics are used in ecoregional classification, the objective is to arrive at river ecoregions. Within this context, there may be terrestrial characteristics that are not of much use in typing river ecosystems. It follows, therefore, that the ecoregional typing process followed here relates primarily to river ecosystems and that any reference to ecoregions in the text are applicable to river ecosystems and are not meant to indicate the boundaries and characteristics of terrestrial ecoregions.

Based on attributes such as physiography, climate, rainfall, geology and potential natural vegetation (Kruger 1983; Schulze 1996; Low & Rebello 1996; van Riet et. al 1997), 31 Level I ecoregions were identified compared to the 18 Level I ecoregions previously delineated (Kleynhans & Hill 1999).

Following from the Level I delineation, the next phase of this project will delineate Level II ecoregions and will use the same typing attributes but in more detail. Level II ecoregions will provide a suitable link to stream channel characteristics. Stream classification is a separate hierarchy and
includes geomorphological classification according to zones, segments and reaches (Wadeson & Rowntree 1999). It is likely that the geomorphological segment level will provide information that can be linked to biological habitat segments (i.e. fish, invertebrate and riparian vegetation habitat segments) that can form a basis for the assessment and estimation of Ecological Reserve requirements.
TABLE OF CONTENTS

FOREWORD................................................................................................................................i

DOCUMENT STATUS AND APPROVAL................................................................. Error! Bookmark not defined.

ACKNOWLEDGEMENTS ................................................................................................. iii

SUMMARY..................................................................................................................... iv

INTRODUCTION............................................................................................................ 1

The rationale for ecoregional typing in South Africa.................................................... 1
Fundamentals of an ecoregional approach for South Africa........................................... 2

CONCEPTS OF ECOREGIONAL CLASSIFICATION................................................ 4

COMPONENTS OF ECOREGIONAL CLASSIFICATION........................................... 7

LEVEL I ECOREGIONS FOR SOUTH AFRICA....................................................... 13

ECOREGION 1: LIMPOPO PLAIN ................................................................. 15
ECOREGION 2: SOUTPANSBERG ................................................................. 17
ECOREGION 3: LOWVELD ................................................................. 19
ECOREGION 4: NORTH EASTERN HIGHLANDS........................................ 21
ECOREGION 5: NORTHERN PLATEAU ..................................................... 23
ECOREGION 6: WATERBERG ................................................................. 25
ECOREGION 7: WESTERN BANKENVELD ............................................... 27
ECOREGION 8: BUSHVELD BASIN ............................................................. 29
ECOREGION 9: EASTERN BANKENVELD ................................................... 31
ECOREGION 10: NORTHERN ESCARPMENT MOUNTAINS......................... 33
ECOREGION 11: HIGHVELD ................................................................. 35
ECOREGION 12: LEBOMBO UPLANDS ....................................................... 37
ECOREGION 13: NATAL COASTAL PLAIN .................................................. 39
ECOREGION 14: NORTH EASTERN UPLANDS ......................................... 41
ECOREGION 15: EASTERN ESCARPMENT MOUNTAINS .................................43
ECOREGION 16: SOUTH EASTERN UPLANDS.................................................45
ECOREGION 17: NORTH EASTERN COASTAL BELT .........................................47
ECOREGION 18: DROUGHT CORRIDOR .................................................................49
ECOREGION 20: SOUTH EASTERN COASTAL BELT ...........................................53
ECOREGION 21: GREAT KAROO .................................................................55
ECOREGION 22: SOUTHERN COASTAL BELT ...................................................57
ECOREGION 23: WESTERN FOLDED MOUNTAINS .........................................59
ECOREGION 24: SOUTH WESTERN COASTAL BELT ........................................61
ECOREGION 25: WESTERN COASTAL BELT ....................................................63
ECOREGION 26: NAMA KAROO .................................................................65
ECOREGION 27: NAMAQUA HIGHLANDS ......................................................67
ECOREGION 28: ORANGE RIVER GORGE ........................................................69
ECOREGION 29: SOUTHERN KALAHARI .........................................................71
ECOREGION 30: GHAAP PLATEAU ...............................................................73
ECOREGION 31: EASTERN COASTAL BELT ....................................................75

REFERENCES .......................................................................................................................77

APPENDIX: ..............................................................................................................................a
List of maps:.......................................................................................................................a
INTRODUCTION

The rationale for ecoregional typing in South Africa

The National Water Act (Act No. 36 of 1998) requires procedures for the determination of the Ecological Reserve, which has broadly been related to the water required to protect the aquatic ecosystems of the water resource. The Ecological Reserve refers to both the quantity and quality of water. Its protection requires specification of a class and resource quality objectives based on such a class. Focussing on ecological issues, resource quality objectives must be determined in terms of aspects such as:

- instream flow;
- water level;
- presence and concentration of particular substances in the water;
- characteristics and quality of the water resource as well as the instream and riparian habitat;
- characteristics and distribution of aquatic biota.

In addition to determination of ecological resource quality objectives, the NWA also makes provision for the establishment of a national monitoring system that must provide for the collection of appropriate data and information to assess the condition of ecological aspects such as:

- quantity of water in the various water resources;
- quality of water resources;
- rehabilitation of water resources;
- compliance with resource quality objectives;
- health of aquatic ecosystems.

It is generally accepted that ecological water requirements will vary widely due to the large diversity of abiotic and biotic conditions in South Africa. Depending on the scale, the determination of the Ecological Reserve and setting reference conditions to assess monitoring data, can be a potentially time consuming and resource intensive process. Ecological classification or typing will allow the grouping of rivers according to similarities based on a top-down nested hierarchical approach. The purpose of this approach is to simplify assessments and statements on ecological water requirements. One of the advantages of such a system is the extrapolation of information from data rich rivers to data poor rivers within the same hierarchical typing context. The ecoregional approach to river typing was developed by Omernik (Omernik 1987, 1995; Omernik & Bailey 1997) and is currently applied by the USEPA as a framework for the formulation of reference conditions and to set resource quality specifications.
**Fundamentals of an ecoregional approach for South Africa**

The principle of river typing is that rivers grouped together at a particular level of the typing hierarchy will be more similar to one another than rivers in other groups. Since the first attempt to type or classify South African rivers according to hydrobiological regions (Harrison 1959), a number of efforts have been made to classify rivers for various purposes (i.e. Brown *et al.* 1996; Eekhout *et al.* 1997; Everett & Quibell 1995; Noble & Hemens 1978). Although a lot of useful information was generated by these exercises, none of the procedures were refined up to the level where it could be used for the purposes of determination of the Ecological Reserve.

The South African approach that was initially the closest to the requirements of Ecological Reserve determination within a general framework was the bioregions approach (Brown *et al.* 1996). The Bioregions were developed as part of a protocol for the selection of reference and monitoring sites for the River Health Programme (RHP) the rivers component of the National Aquatic Ecosystems Biomonitoring Programme (NAEBP). Bioregions are strongly based on a bottom-up approach that takes into account known available distributional information on particular groups of aquatic biota (i.e. invertebrates and fish) at a tertiary catchment level (Midgley *et al.* 1994) to provide so-called biogeographical regions (Eekhout *et al.* 1997). During a workshop, individual scientists with knowledge on specific geographical areas endeavoured to provide a geographical context to these biogeographical regions. This process was augmented with detail information on physiography and resulted in the delineation of 18 bioregions as well as the identification of subregions (based on longitudinal river zonation) and a framework for the delineation of so-called river types (Brown *et al.* 1996). However, the applicability of the bottom-up part of this approach is dependent on the distribution records of aquatic biota being representative and relatively complete. This is to various degrees not true for all parts of South Africa and it was therefore decided that a more inclusive process should be followed for Ecological Reserve determination. This process is considered to be a nested top-down hierarchy. The Level I ecoregional typing is thus a refinement or modification of the RHP bioregion map as far as the upper level of the hierarchy is concerned i.e., the ecoregional approach only considers the physical/abiotic attributes of the geographical areas of South Africa. The ecoregional approach is intended to provide a more pragmatic basis from which ecological similarities between ecosystems can be derived and from which expected conditions can be specified. However, it must be emphasized that the biological distribution information used for bioregions should not be ignored, but should rather be used within the delineations provided by the ecoregional approach.

During a workshop on river ecoregional typing in February 1998, a decision was taken as to the conceptual approach that should be followed (Louw 1998). It was decided that the hierarchical ecoregional classification approach of Omernik (1987) should be followed for the purposes of the determination of the Ecological Reserve. Since then the development of the delineation of river types
for rivers of Mpumalanga (pilot study for the implementation of the RHP) and for the establishment of reference sites (Dallas & Fowler 2000), to a large extent followed the ecoregional approach.
CONCEPTS OF ECOREGIONAL CLASSIFICATION

Omernik & Bailey (1997) point out that an ecosystems approach recognizes that ecosystem components do not function as independent systems but that they exist in association with one another. This principle forms the basis of ecoregional classification.

Omernik (1987) defined the ecoregions of the USA on the principle that ecosystems and their components display regional patterns that are reflected in spatially variable combinations of causal factors such as climate, mineral availability (soils and geology), vegetation and physiography. These factors interact, but the importance of each factor in determining the character of ecosystems varies from place to place. Omernik’s (1987) approach is based on patterns of terrestrial characteristics and on the premise that relatively homogenous areas exist and that these areas can be defined by simultaneously analysing a combination of determinants of causal factors. In this approach, ecoregions are regions of relative homogeneity in the patterns of ecological systems.

Another fundamental principle of ecoregional classification is the use of multiple characteristics at each level of a typing hierarchy. Ecological regions are then regions within which there is relative similarity in the mosaic of ecosystems and ecosystem components (biotic and abiotic, aquatic and terrestrial). Maps of single characteristics only illustrate regionalities in that characteristic. The delineation of ecological regions requires the evaluation of maps of all geographic phenomena believed to cause or reflect spatial differences in ecosystems. Where combinations of these phenomena coincide spatially, the ecosystems are likely to be similar. The process requires qualitative examination to account for the differences in generality, accuracy, and particular classifications of each map. The regions are essentially sketched (Omernik 1995; Omernik pers. comm. 1998), using expert judgement and local knowledge of ecosystem characteristics.

Ecoregional classification is a hierarchical procedure that involves the delineation of ecoregions with a progressive increase in detail at each higher level of the hierarchy, i.e. essentially the same characteristics are used at the various levels, but with more detail as one moves to a higher level in the hierarchy. In addition, the characteristics that are more or less important can vary from one place to another. In some mountainous areas, for example, altitudinal banding (where certain mosaics in the flora and fauna are also reflected in differences in precipitation, temperature, land use, soils etc.) reflects in ecological regions. In other regions, patterns in hydrology, vegetation, soils, and land-use follow distinct differences in bedrock or surficial geology (Omernik pers. comm. 1998).
For the determination of the Ecological Reserve within the framework of the ecoregional approach, the quantity and quality of water at any point in a river is a reflection of the aggregate of the characteristics of the drainage area upstream (or "up gradient") from that point. The definition of the areas within which this aggregate is similar will provide ecoregional delineation within which water quantity and quality will tend to be similar. Sets of reference sites (or conditions) for relatively undisturbed and disturbed watersheds within these regions can be used to extrapolate to other portions of each ecoregion. These reference sites/catchments can also be used to estimate contributions to larger basins that straddle more than one ecoregion (Omernik pers. comm. 1998).

Gallant et al. (1996) based the decision of when to delineate an area as an ecoregion on judgment that considers:

- The combination and pattern of environmental attributes present in the specific area compared to those in surrounding areas. The size and distribution of the attributes that make up a landscape pattern are important for deciding whether areas should be classified as separate regions or consolidated within a single region at a given level of regional resolution.

- That no fixed rules exist for designating a minimum area criterion for ecoregions. In Alaska, 10 000 km² or more is considered to be a "good" size for regions of state-level frameworks, i.e. Level I.

- That the resolution and accuracy of the reference materials imposes a limitation on the level of detail that can be depicted on an ecoregion map. Delineating regions that are more detailed than the bulk of the reference material from which they were defined is misleading. Ideally, regions should be less detailed than the components that were used to define them.

- That the intended use of the final framework affects the size and level of detail of the ecoregions. A general framework will have relatively large regions separated by smooth boundaries with fairly general descriptions listing only the major characteristics of each region. In contrast, a very refined framework will have small ecoregions (or more levels of regional hierarchy) with more intricate boundaries and more detailed descriptions of regional characteristics. Important here is that the purpose for creating the framework governs the level of detail that should be shown on the final product.

This document provides a delineation of ecoregions for South Africa at Level I of the hierarchy. Although the Level I River Ecoregions are broadly useful for identifying the main characteristics of major rivers, their foremost purpose is to serve as a basis for the more detailed Level II delineations.
This means that delineation and typing will mostly have to be done to Level II where it is expected that the determination of the Ecological Reserve becomes meaningful for management purposes. Level II ecoregions can then be linked to the river channel by following geomorphological stream classification principles (i.e. Frissell et al. 1986; Wadeson & Rowntree 1999).

The following summarizes the ecoregional typing and stream classification process:

**Level I:** This level of typing is based on the premise that ecosystems and their components display regional patterns that are reflected in spatially variable combinations of causal factors such as climate, mineral availability (soils and geology), vegetation and physiography (Omernik, 1987). In South Africa, physiography, climate, geology, soils and potential natural vegetation, have been used as the delineators of Level I.
Future delineation exercises will deal with the following:

**Level II:** The same characteristics as for the Level I typing is used, but in more detail. Level II typing will produce regional or sub-catchment scale ecotypes. Level II will be a suitable stage to link to stream classification. Due to the amount of detail required to progress beyond Level II (i.e. Levels III & IV), such delineations will probably not be done in the near future.

**Stream Classification:** This provides the approach in which the river can be typed according to a hierarchical geomorphological classification system (Wadeson & Rowntree 1999). This will be done within a particular ecoregion level (Level II at this stage). The hierarchical classification follows, in sequence:

- Segment,
- Longitudinal zone
- Reach, and
- Morphological units (more or less equivalent to habitats/biotopes).

**Geomorphological segments:** The level to which stream classification needs to be done will be determined by the detail required for the particular situation and whether this provides a suitable resolution and framework for management. At this stage, it seems that classification up to at least geomorphological segment level (Wadeson & Rowntree 1999), will provide this kind of information. Aspects such as channel slope, local hydrology and water chemistry will also be important considerations in the delineation of stream segments. Geomorphological segments should be identified within the context of the ecoregion (Level II in this case).

**Biological habitat segments:** The geomorphological segment (within its ecoregional level context) provides the physical template to which various biota respond. At this stage instream groups of biota such as invertebrates and fish, and riparian biota such as riparian vegetation provide entities that can be measured and also associated with particular environmental conditions. The geomorphological segment may be appropriate for some biota but not for others and this leads to the concept of the biological habitat segment (Ramm 1988). This means that some geomorphological segments may be combined for some biota (i.e. the species present are not different between two neighbouring geomorphological segments - this is often the situation with fish, and fish habitat segments may therefore be different from geomorphological segments). In contrast, geomorphological segments may be completely valid for, for example. riparian vegetation. It is also possible that although the species (i.e. fish) present in two geomorphological segments may be identical, the factors controlling the fish assemblages are different (i.e. different guilds of species may be more common in respective segments). The implication is that the Ecological Reserve and the factors determining it may be different although the species present are the same (cf. Kleynhans 1999).
COMPONENTS OF ECOREGIONAL CLASSIFICATION

As indicated previously, the procedure followed for Levels I and II ecoregional typing is essentially the same in the sense that the same attributes are used but in more detail at the higher level of the hierarchy (Figure 1). Stream classification is also shown in Figure 1 in order to indicate the possible linkage with the ecoregions.

Map overlays of the various variables were prepared and used to qualitatively determine ecoregions. This process was repeated several times until the resulting delineations could not be improved upon based on the available information.

The following variables are considered in ecoregional classification:

Physiography

The detail of physiographic classification systems used for South Africa varies widely. However, the approach of Kruger (1983) provides an approximation of a hierarchical system, which is considered suitable for the purposes of ecoregional typing. The focus of the physiography was on the broad terrain morphological classes (Kruger 1983).

In addition to the above, the following physiographic aspects also formed part of the overall assessment (Schulze et al. 1997):

Relief:

This is an expression of the distance between the top of a slope/hill and the bottom. The following relief classes are distinguished:

- 0-30 m
- 0-130 m
- 30-210 m
- 30-450 m
- 130-450 m
- 450+ m
- 450-900 m
- 130-900 m
- 900+ m
Figure 1: The ecoregional typing procedure.
The influence of relief on soil can be viewed in terms of higher tendency of soil loss and shallower soils occurring where greater relief is present. Flood peaks respond more rapidly with the steeper slopes that are associated with high relief.

Slope form (slope shape):

Concave slopes are steep near the top of the slope and flatten out towards the bottomlands. Soil moisture tends to accumulate at the foot of the slope by subsurface lateral moisture flow.

Convex slopes are flatter near the top and steepen towards the bottomlands.

Straight slopes indicate a generally even gradient down a slope.

Drainage density:

Indicates the length of river channel (km) per unit area (km²). The higher the drainage density, the more rapidly a catchment discharges its runoff after a rainfall event.

Stream frequency:

This is the number of streams per unit area (streams/ km²). In Southern Africa, stream frequency ranges from low (0.0-1.5), medium (1.5-6.0), high (6.0-10.5) to very high (10.5-13.5).

Area with slopes < 5%

This is usually used as an indication of the potential for cultivation. For the purposes of this document, lower percentages of flat land would indicate higher erosion and runoff potentials.

Altitude:

Topography is considered a static feature of the physical landscape, which is described by altitude, including the change of altitude over distance. Altitude as such exerts a major influence on macro-, meso- and micro- scale features of climate and on hydrological and ecological responses.

Information sources:

Climate

Although several variables are indicative of climatic conditions, direct information is often spatially scattered and natural vegetation is often used as an indicator of climate (Rowe 1996).

Climate refers to the enduring regime of the atmosphere and represents a composite of day-to-day weather conditions and atmospheric elements within a specified place and over a long period of time (Schulze et al. 1997). The following individual climatic variables were considered:

Mean annual precipitation (MAP):

Information was obtained from Schulze et al. (1997).

Coefficient of variation (%) of annual precipitation:

It has been pointed out that on a monthly or seasonal basis, rainfall variability is considerably higher than on an annual basis. The map of inter-annual CV is thus a best-case scenario of rainfall variation (Schulze et al. 1997).

Rainfall concentration index:

This refers to spread of rainfall through the year where a concentration index of 100% would mean that all of a location’s rainfall falls highly concentrated in one single month. A concentration index of 0% would indicate that the rainfall for each month of the year is the same. The higher the concentration index, the less spread of rainfall season over time. This is valid for high or low rainfall areas or in a winter or summer rainfall region (Schulze et al. 1997).

Rainfall seasonality:

Rainfall seasonality (i.e. the season during which rain predominantly falls) is indicated as (Schulze et al. 1997):

- All year,
- Winter,
- Early summer (December)
- Mid summer (January)
- Late summer (February)
- Very late summer (March to May)
Geology and soils

Geological information was not analysed in any detail. The map of the simplified geology of Southern Africa (Geology Map of South Africa, Lesotho and Swaziland, 1984: Council for Geoscience, Pretoria) was used as the main reference source. This indicated broad correspondence between geology, physiography and potential natural vegetation.

Information on soils followed Schulze et al. (1997) again with no attempt to analyse the information. The soil zone map provided indication of broad similarities between geology, physiography and potential natural vegetation.

Information Sources:


Potential natural vegetation

Natural vegetation is an integrated reflection of diverse variables such as climate, rainfall and geology and soils. The available vegetation classification systems for South Africa were not always done at the same scale for various parts of the country. At Level I in particular, various vegetation types (Low & Rebelo 1997) were combined for the delineation of some ecoregions.

Information Sources:

The classification of Low & Rebelo (1996) was primarily used. For broader reference purposes van Riet et al. (1997) and the vegetation biomes of Rutherford & Westfall (1994) were also used. In some cases, the veld types of Acocks (1988) provide information more suitable for use at the more detailed future Level II ecoregional typing. In certain parts of the country the Beta version (2004) of the National Botanical Institute’s vegetation map was used.
LEVEL I ECOREGIONS FOR SOUTH AFRICA

At the resolution used for Level I ecoregions, physiography and vegetation types can be regarded as integrators of geology, soils, geomorphology and climate (cf. Rowe 1996). As a consequence, physiography (specifically terrain morphology) and vegetation types (or a combination of vegetation types) tended to be the primary delineators of ecoregions at Level I in terms of defining boundaries.

A total of 31 Level I ecoregions were delineated for South Africa (Figure 2).

The attributes of the delineated ecoregions are summarized and tabulated in the following section. The tables also indicate whether an attribute was used as a primary or modifying determinant of ecoregion boundaries. The summarized description for each ecoregion is limited to general attributes that are mostly related to the rivers and streams of the particular ecoregion. The following aspects are covered in the summarized section:

Terrain morphology,
Main vegetation types,
Mean annual precipitation,
Coefficient of variation of mean annual precipitation:
Drainage density,
Stream frequency,
Slopes,
Median annual simulated runoff
Mean annual temperature.

The maps used to delineate ecoregion boundaries are provided in the Appendix. Information on geology, soils, drainage density, stream frequency and percentage of slopes < 5% is presented only on maps in the Appendix.
Figure 2: Level I River Ecoregions for South Africa, Lesotho and Swaziland.
ECOREGION 1: LIMPOPO PLAIN

Primary boundary determinants:
Plains and lowlands characterize this ecoregion with a low to moderate relief and vegetation consisting mostly of Bushveld types and Mopane veld, characterizes this region.

General:
This is generally a low laying, dry to arid, hot region with virtually no perennial streams originating in the area itself. Perennial rivers that traverse this region include the Crocodile (west), Marico, Mokolo, Lephala, and Mogalakwena.

- Mean annual precipitation: Low to arid.
- Coefficient of variation of annual precipitation: Moderately high to high
- Drainage density: Mostly low but with some areas in the north having a high drainage density.
- Stream frequency: Mostly low to medium, but high in northeastern areas.
- Slopes <5%: Generally, >80% of the area.
- Median annual simulated runoff: Very low to low.
- Mean annual temperature: High to very high

Size = 39383.5 km²

Table 1: Main attributes of the Limpopo Plain Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>LIMPOPO PLAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; Plains; moderate relief; Lowlands; Hills and Mountains; moderate and high relief; Closed hills; Mountains; moderate and high relief (limited)</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Mopane Bushveld; Sweet Bushveld; Mixed Bushveld; Waterberg Moist Mountain Bushveld; Clay Thorn Bushveld; Kalahari Plains Thorn Bushveld</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Secondary)</td>
<td>300-1100 (1100-1300 limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>200 to 600</td>
</tr>
<tr>
<td>Coefficient of Variation (%) of annual precipitation</td>
<td>25 to 40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>60 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>18 to &gt;22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>26 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>20 to &gt;24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>16 to &gt;20</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): July</td>
<td>2 to &gt;10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 to 60 (60-100 limited)</td>
</tr>
</tbody>
</table>
ECOREGION 2: SOUTPANSBERG

Primary boundary determinants:
This is a mountainous area characterised by moderate to high relief and vegetation consisting mainly of Bushveld types but with patches of Afromontane Forest. The Blouberg to the west of the Soutpansberg is included in this region.

General:
Several streams have perennial sources in this region, e.g. the Luvuvhu, Mutale, Nzhelele, Nwanedzi and Brak.

- Mean annual precipitation: Generally moderate to high, but very high in isolated spots towards the east.
- Coefficient of variation of annual precipitation: Varies from very low to moderate
- Drainage density: Medium
- Stream frequency: Medium to high
- Slopes <5%: <20% of the region.
- Median annual simulated runoff: Mostly moderate but high to very high in spots in the south.
- Mean annual temperature: Mostly moderate, but very hot in the east.

Size = 7323.2 km$^2$

Table 2: Main attributes of the Soutpansberg Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>SOUTPANSBERG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; (limited) Plains; Moderate Relief; (very limited) Lowlands; Hills and Mountains; Moderate and High Relief; Closed Hills; Mountains; Moderate and High Relief;</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Sour Lowveld Bushveld; Soutpansberg Arid Mountain Bushveld; Mopane Bushveld (very limited) Patches AfroMontane Forest.</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>300-1700</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>200 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>55 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>16 to &gt;22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>22 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>16 to &gt;24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to &gt;20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>4 to &gt;10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 to 200; &gt;250 (limited)</td>
</tr>
</tbody>
</table>
ECOREGION 3: LOWVELD

Primary boundary determinants:
This hot and dry region is characterised by plains with a low to moderate relief and vegetation consisting mostly of Lowveld Bushveld types. Open hills with high relief and low mountains with high relief are present towards the west on the boundary with the North Eastern Highlands. In the north Mopane Bushveld and Mopane Shrubveld occur.

General:
Although several large perennial streams traverse this region, e.g. White and Black Umfolozi, Mkuze, Pongolo, Great Usutu, Komati, Crocodile, Sabie, Olifants, Letaba and Luvuvhu, few perennial streams originate here.

- Mean annual precipitation: Tends to be moderate towards the west, but low over most of the region.
- Coefficient of variation of annual precipitation: Mostly moderate.
- Drainage density: Mostly low, but high in some of the central areas.
- Stream frequency: Mostly low to medium but high in some of the central areas.
- Slopes <5%; >80% of the area.
- Median annual simulated runoff: Mostly low/moderate, but moderate in areas.
- Mean annual temperature: High to very high.

Size = 56852.5 km²

Table 3: Main attributes of the Lowveld Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Lowveld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology; Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; Plains; Moderate Relief; Lowlands, Hills and Mountains; Moderate and High Relief (limited) Open Hills, Lowlands; Mountains; Moderate to High Relief; (limited) Closed Hills; Mountains; Moderate and High Relief (Limited)</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Mopane Bushveld; Mopane Shrubveld; Mixed Lowveld Bushveld; Sour Lowveld Bushveld; Sweet Lowveld Bushveld; Natal Lowveld Bushveld; Lebombo Arid Mountain Bushveld; Mixed Bushveld North Eastern Mountain Grassland;</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>0-700; 700-1300 limited</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>200 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>30 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>16 to &gt;22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>24 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>18 to &gt;24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to &gt;20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>4 to &gt;10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>10 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 4: NORTH EASTERN HIGHLANDS

Primary boundary determinants:
This is a mountainous area characterised by closed hills and mountains with moderate to high relief and vegetation comprising North-Eastern Highveld Grassland and Lowveld Bushveld types. Patches with Afromontane Forest are scattered throughout the region.

General:
Generally, this ecoregion can be regarded as transitional between the Lowveld and the Northern Escarpment. Towards the south, larger rivers such as the Great Usutu and Pongolo have some of their sources here, while perennial tributaries commonly contribute to the flow of larger rivers along the length of the region.

- Mean annual precipitation: Moderate to high.
- Coefficient of variation of annual precipitation: Moderate to very low.
- Drainage density: Generally medium
- Stream frequency: Low/medium to medium high
- Slopes <5%: Varies from <20% to 25 – 50%.
- Median annual simulated runoff: Moderate/high to high.
- Mean annual temperature: Cool to moderate

Size = 16140.3 km²

Table 4: Main attributes of the North Eastern Highlands Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>NORTH EASTERN HIGHLANDS</th>
</tr>
</thead>
</table>
| Terrain Morphology: Broad division (dominant types in bold) (Primary) | Plains; Moderate Relief
| Open Hills, Lowlands, Mountains; Moderate to High Relief
| Closed Hills, Mountains; Moderate and High Relief |
| Vegetation types (dominant types in bold) (Primary) | Mixed Bushveld; Mixed Lowveld Bushveld; Sour Lowveld Bushveld; Natal Lowveld Bushveld (limited)
| North Eastern Mountain Grassland; Patches Afromontane Forest |
| Altitude (m a.m.s.l) (primary)                        | 300-1300 (1300-1500 limited)                                |
| MAP (mm) (modifying)                                 | 400 to 1000                                                |
| Coefficient of Variation (% of annual precipitation)  | <20 to 30                                                   |
| Rainfall concentration index                         | 50 to >65                                                   |
| Rainfall seasonality                                 | Early to mid summer                                         |
| Mean annual temp. (°C)                               | 16 to 22                                                   |
| Mean daily max. temp. (°C): February                 | 24 to 32                                                   |
| Mean daily max. temp. (°C): July                     | 18 to>22                                                   |
| Mean daily min. temp. (°C): February                 | 14 to 20                                                   |
| Mean daily min temp. (°C): July                      | 2 to 10                                                    |
| Median annual simulated runoff (mm) for quaternary catchment | 20 to >250                                              |
**Ecoregion 5: Northern Plateau**

Primary boundary determinants:
The topography, dominated by plains with low to moderate relief is characteristic of this plateau. Vegetation consists mainly of Mixed Bushveld, but with limited areas of North-Eastern Mountain Grassland also being prominent.

General:
The seasonally flowing Sand River is the major river here. No perennial streams have their sources in this region. Some reflection of this is the low drainage density here.

- Mean annual precipitation: Generally moderate
- Coefficient of variation of annual precipitation: Moderate
- Drainage density: Low
- Stream frequency: Low to medium
- Slopes <5%; >80%.
- Median annual simulated runoff: Low to moderate.
- Mean annual temperature: Moderate.

Size = 7245.9 km²

**Table 5: Main attributes of the Northern Plateau Ecoregion.**

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>NORTHERN PLATEAU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; Plains; Moderate Relief; Closed Hills; Mountains; Moderate and High Relief (Limited)</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Mixed Bushveld; Clay Thorn Bushveld (limited); North Eastern Mountain Grassland (Limited)</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>900-1500 (1500-1700 limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>300 to 700</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>25 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>60 to &gt;85</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>16 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>24 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>18 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>2-5</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>10 to 60; 60 to 80 (limited)</td>
</tr>
</tbody>
</table>
Primary boundary determinants:
The Waterberg is predominantly a tableland with moderate to high relief. Bushveld types dominate the vegetation with Waterberg Moist Mountain Bushveld being the most common.

General:
The sandstones on the tableland are almost flat lying and are important escarpment shapers. Perennial rivers such as the Mogalakwena and Lephalala have their sources in the Waterberg.

- Mean annual precipitation: Generally moderate.
- Coefficient of variation of annual precipitation: Moderate.
- Drainage density: Low to medium.
- Stream frequency: Medium/high to low/medium.
- Slopes <5%: >80%
- Median annual simulated runoff: Generally moderate.
- Mean annual temperature: Moderate to moderate/high.

Size = 8844.9 km²

Table 6: Main attributes of the Waterberg Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>WATERBERG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Lowlands; Hills and Mountains; Moderate and High Relief; Table Lands; Moderate and High Relief, Plains; Low Relief (limited)</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Waterberg Moist Mountain Bushveld; Mixed Bushveld; Sweet Bushveld (limited)</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Modifying)</td>
<td>700 –900, 900-1700</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>300 to 600</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>20 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>60 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>14 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>24 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>16 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>2 to 6</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 (limited); 10 to 60, 60 to 100 (limited)</td>
</tr>
</tbody>
</table>
ECOREGION 7: WESTERN BANKENVELD

Primary boundary determinants:
This region has a complex topography that varies from lowlands, hills and mountains to closed hills and mountains with the relief varying from moderate to high. Although various Bushveld and Grassland types occur, Mixed Bushveld is the most definitive vegetation type of the region.

General:
Several rivers traverse this region, e.g. the Marico, the Crocodile (west), the Elands (west) and the Pienaars. Some perennial tributaries of these rivers rise in the southern part of the region in particular. The perennial tributary of the Sand River has its source in the northern part of the region.

- Mean annual precipitation: Low to moderate.
- Coefficient of variation of annual precipitation: Moderate.
- Drainage density: Moderate but low in parts.
- Stream frequency: Low to medium.
- Slopes <5%: Varies from <20%, 20-50%, 60-80% and in few cases >80%
- Median annual simulated runoff: Moderate/low to moderate.
- Mean annual temperature: Moderate to hot in limited areas.

Size = 19365.5 km²

Table 7: Main attributes of the Western Bankenveld Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>WESTERN BANKENVELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; Plains; Moderate Relief; Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills; Lowlands; Mountains; Moderate to High Relief; Closed Hills; Mountains; Moderate and High Relief;</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Waterberg Moist Mountain Bushveld; Mixed Bushveld; Kalahari Plains Thorn Bushveld (limited); Clay Thorn Bushveld; (limited) Rocky Highveld Grassland; Dry Clay Highveld Grassland; (limited)</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Modifying)</td>
<td>900-1700</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>400 to 700</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>20 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>60 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>14 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>24 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>14 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 6</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>20 to 80, 80 to 100 (limited)</td>
</tr>
</tbody>
</table>
ECOREGION 8: BUSHVELD BASIN

Primary boundary determinants:
This region consists predominantly of plains with a low relief with Mixed Bushveld being the definitive vegetation type. In the east plains with a moderate relief and lowlands with a moderate relief occur.

General:
Several perennial rivers traverse the region, e.g. the Marico, Elands (West), Crocodile (West), Pienaars and Olifants. Virtually no perennial tributaries arise in the region.

- Mean annual precipitation: Moderate to low.
- Coefficient of variation of annual precipitation: Moderate
- Drainage density: Low.
- Stream frequency: Low to medium.
- Slopes <5%; >80%. Few areas 20-50% and 50-80%.
- Median annual simulated runoff: Moderately low to moderate.
- Mean annual temperature: Generally high.

Size = 32460.1 km²

Table 8: Main attributes of the Bushveld Basin Ecregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Bushveld Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; Plains; Moderate Relief; Lowlands; Hills and Mountains: Moderate and High Relief; Open Hills; Lowlands; Mountains: Moderate to High Relief; Closed Hills; Mountains: Moderate and High Relief (limited)</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Mixed Bushveld; Clay Thorn Bushveld; Waterberg Moist Mountain Bushveld (limited)</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Secondary)</td>
<td>700-1700 (1700-1900 very limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>400 to 600</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>25 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>55 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>14 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>22 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>14 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 6</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>20 to 100</td>
</tr>
</tbody>
</table>
ECOREGION 9: EASTERN BANKENVELD

Primary boundary determinants:
Closed hills and mountains with moderate and high relief together with North-eastern Mountain Grassland and Mixed Bushveld are definitive of the region.

General:
Distinctive escarpments occur along the eastern boundary in particular. Large rivers that traverse the area are the Olifants, Elands and Steelpoort with perennial tributaries in the region contributing to their flow. The Crocodile River (East) has many of its sources in this area.

- Mean annual precipitation: Moderate to moderately high.
- Coefficient of variation of annual precipitation: Low to moderate.
- Drainage density: Predominantly medium.
- Stream frequency: Medium/high but low/medium in limited areas.
- Slopes <5%: <20%, 20-50% in limited areas.
- Median annual simulated runoff: Mostly moderate but moderately high in areas.
- Mean annual temperature: Mostly moderate.

Size = 20098.8 km²

Table 9: Main attributes of the Eastern Bankenveld Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Eastern Bankenveld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division</td>
<td>Plains; Low Relief; (very limited)</td>
</tr>
<tr>
<td>(dominant types in bold) (Primary)</td>
<td>Plains; Moderate Relief;</td>
</tr>
<tr>
<td></td>
<td>Lowlands; Hills and Mountains; Moderate and High Relief; (limited)</td>
</tr>
<tr>
<td></td>
<td>Open Hills; Lowlands; Mountains; Moderate to High Relief; (limited)</td>
</tr>
<tr>
<td></td>
<td><strong>Closed Hills; Mountains; Moderate and High Relief</strong></td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Sour Lowveld Bushveld; <strong>Mixed Bushveld</strong>; Clay Thorn Bushveld (limited);</td>
</tr>
<tr>
<td></td>
<td>Rocky Highveld Grassland; Moist Sandy Highveld Grassland; North Eastern Mountain Grassland; Patches AfroMontane Forest.</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Modifying)</td>
<td>500-2300</td>
</tr>
<tr>
<td>MAP (mm) (modify)</td>
<td>300 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 34</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>55 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>10 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>18 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>12 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>8 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 8</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>20 to 150; 200 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 10: NORTHERN ESCARPMENT MOUNTAINS

Primary boundary determinants:
The topography of this high lying region is highly definitive and consists of closed hills and mountains with a moderate to high relief. Towards the east, a well-defined escarpment is present along the majority of the length of the region. Northeastern Mountain Grassland is the dominant vegetation type in the region with areas of Sour Lowveld Bushveld towards the east. Patches of Afromontane Forest occur regularly as an interrupted, thin band towards the eastern boundary.

General:
Drainage density is high and coefficient of variation of precipitation is very low. Rivers such as the Blyde, Sabie and Letaba have their sources here. Perennial tributaries of rivers such as the Crocodile, Komati and Olifants occur commonly in the region.

- Mean annual precipitation: High in most areas.
- Coefficient of variation of annual precipitation: Varies from low to very low.
- Drainage density: Low
- Stream frequency: Mostly medium to high
- Slopes <5%: <20%.
- Median annual simulated runoff: Generally high to very high
- Mean annual temperature: Cool to moderate.

Size = 10441.3 km²

Table 10: Main attributes of the Northern Escarpment Mountains Ecocregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Northern Escarpment Mountains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Moderate Relief; Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>North Eastern Mountain Grassland; Sour Lowveld Bushveld; Mixed Bushveld (limited) Patches of Afromontane Forest</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Secondary)</td>
<td>500-900 (limited) 900-2300</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>500 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>50 to 65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>10 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>16 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>12 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>8 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 8</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>40 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 11: HIGHVELD

Primary boundary determinants:
Plains with a moderate to low relief, as well as various grassland vegetation types (with moist types present towards the east and drier types towards the west and south), define this high lying region.

General:
Several large rivers have their sources in the region, e.g. Vet, Modder, Riet, Vaal, Olifants, Steelpoort, Marico, Crocodile (west), Crocodile (east) and the Great Usutu,

- Mean annual precipitation: Rainfall varies from low to moderately high, with an increase from west to east.
- Coefficient of variation of annual precipitation: Moderately high in the west, decreasing to low in the east.
- Drainage density: Mostly low, but medium in some areas.
- Stream frequency: Low to medium.
- Slopes <5%: >80%, but 20-50% in a few hilly areas.
- Median annual simulated runoff: Moderately low to moderate.
- Mean annual temperature: Hot in the west and moderate in the east.

Size = $163615.1 \text{ km}^2$

Table 11: Main attributes of the Highveld Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Highveld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology; Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills; Lowlands; Mountains; Moderate to high Relief Closed Hills. Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Mixed Bushveld (limited); Rocky Highveld Grassland; Dry Sandy Highveld Grassland; Dry Clay Highveld Grassland; Moist Cool Highveld Grassland; Moist Cold Highveld Grassland; North Eastern Mountain Grassland; Moist Sandy Highveld Grassland; Wet Cold Highveld Grassland (limited); Moist Clay Highveld Grassland; Patches Afromontane Forest (very limited)</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>1100-2100, 2100-2300 (very limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>400 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>45 to 65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to late summer</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C); February</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C); July</td>
<td>20 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C); July</td>
<td>14 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C); February</td>
<td>10 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C); July</td>
<td>-2 to 4</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>5 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 12: LEBOMBO UPLANDS

Primary boundary determinants:
Closed hills and mountains define this long, thin region with a moderate to high relief.

General:
Lebombo Arid Mountain Bushveld predominantly characterizes the vegetation. Geologically, basalts and rhyolites are also distinctive. Several large rivers traverse this region, e.g. Olifants, Sabie, Crocodile, Komati, Great Usutu, Pongolo and Mkuze. However, no perennial streams originate in this region.

- Mean annual precipitation: Low in the north to moderate in the south
- Coefficient of variation of annual precipitation: Moderately high in the north to moderately low in the south.
- Drainage density: Medium.
- Stream frequency: Medium to high in the north to high to medium in the south.
- Slopes <5%: <20%.
- Median annual simulated runoff: Moderate to low.
- Mean annual temperature: High to very high.

Size = 5365.5 km²

Table 12: Main attributes of the Lebombo Uplands Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Lebombo Uplands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division dominant types in bold (Primary)</td>
<td>Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>Sweet Lowveld Bushveld; Lebombo Arid Mountain Bushveld</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (primary)</td>
<td>0-500</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>400 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>45 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to mid summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>18 to &gt;22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>26 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>20 to &gt;24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>18 to &gt;20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>6 to &gt;10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>20 to 150</td>
</tr>
</tbody>
</table>
ECOREGION 13: NATAL COASTAL PLAIN

Primary boundary determinants:
This is a low-lying area, characterised by plains with a low relief.

General:
Coastal Bushveld/Grassland dominates the vegetation. Large rivers such as the Mfulozi, Mkuze and Mhlatuze traverse this region. Stream frequency is low to medium and few perennial streams originate in this region.

- Mean annual precipitation: Moderate to high.
- Coefficient of variation of annual precipitation: Low to moderate.
- Drainage density: Low.
- Stream frequency: Low to medium.
- Slopes <5%: >80%.
- Median annual simulated runoff: Moderate to high.
- Mean annual temperature: High to very high.

Size = 8273 km²

Table 13: Main attributes of the Natal Coastal Plain Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Natal Coastal Plain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold)</td>
<td>Plains: Low Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>Coastal Bushveld/Grassland; Subhumid Lowveld Bushveld; Natal Lowveld Bushveld; Patches Sand Forest; Valley Thicket (limited)</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>0-300</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>500 to 600 (limited), 600 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 30</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>15 to 50</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Mid to late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>20 to &gt;22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>26 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>20 to &gt;24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>&gt;20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>8 to &gt;10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>40 to 80; 100 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 14: NORTH EASTERN UPLANDS

Primary boundary determinants:
This region is very diverse with lowlands, hills and mountains with moderate and high relief, as well as closed hills and mountains with moderate and high relief, being the defining characteristics.

General:
Grassland and Bushveld types, mainly Natal Central Bushveld and Valley Thicket characterize the vegetation. Large rivers such as the Thukela, Mooi, and Buffalo traverse this region while the Mhlatuze have its source in the region.

- Mean annual precipitation: Moderate to moderately high.
- Coefficient of variation of annual precipitation: Moderately low to moderate
- Drainage density: From west to east, it varies from low, medium to high.
- Stream frequency: Generally varying from east to west from low/medium, medium/high to very high
- Slopes <5%: Varying from west to east; 50-80%, 20-50% and <20%.
- Median annual simulated runoff: Varying from moderate to moderately high.
- Mean annual temperature: Moderate to high.

Size = 33593.7 km²

Table 14: Main attributes of the North Eastern Uplands Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>North Eastern Uplands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Moderate Relief (limited); Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills; Lowlands; Mountains; Moderate to High Relief; Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>Natal Lowveld Bushveld (limited); Natal Central Bushveld; Coast Hinterland Bushveld; Coastal Bushveld/Grassland; Valley Thicket; Short Mistbelt Grassland; North Eastern Mountain Grassland; Moist Upland Grassland; Patches Afromontane Forest</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (modifying)</td>
<td>0-100 (limited), 100-1500</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>600 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 30</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>15 to 65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>14 to &gt;22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>20 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>16 to &gt;24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>12 to &gt;20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to &gt;10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>40 to 250; &gt;250 (limited)</td>
</tr>
</tbody>
</table>
ECOREGION 15: EASTERN ESCRAPMENT MOUNTAINS

Primary boundary determinants:
This high lying region is characterized by closed hills, mountains with moderate and high relief with prominent escarpments towards the east.

General:
The vegetation consists of a range of grassland types with Afro Mountain and Alti Mountain Grassland being the defining types. Several major South African rivers have their sources in this region, e.g. Orange, Caledon, Wilge, Thukela, Buffalo, Mooi, Mzimkulu, Mzimvubu, Mgeni and Mkomazi,

- Mean annual precipitation: Moderate to very high.
- Coefficient of variation of annual precipitation: Very low to moderate.
- Drainage density: Medium.
- Stream frequency: Medium high.
- Slopes <5%: Generally <20%.
- Median annual simulated runoff: Moderate to very high.
- Mean annual temperature: Very low to moderate.

Size = 66504.8 km²

Table 15: Main attributes of the Eastern Escarpment Mountains Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Eastern Escarpment Mountains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Moderate Relief (limited); Lowlands, Hills and Mountains; Moderate and High Relief Open Hills; Lowlands; Mountains; Moderate to High Relief Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>South Eastern Mountain Grassland; AltiMountain Grassland; AfroMountain Grassland; Moist Upland Grassland; North Eastern Mountain Grassland; Moist Cold Highveld Grassland; Moist Cool Highveld Grassland; Moist Sandy Highveld Grassland; Dry Sandy Highveld Grassland Natal Central Bushveld (limited); Patches Afromontane Forest.</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) Secondary</td>
<td>1100-3100; 3100-3500 limited</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>400 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>30 to 65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>&lt;8 to 18</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>&lt;10 to 28</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>&lt;10 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>&lt;8 to 16</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>&lt;2 to 4</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>10 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 16: SOUTH EASTERN UPLANDS

Primary boundary determinants:
A complex range of terrain morphological classes occur in this region: plains with a moderate relief, lowlands with a low relief, lowlands with a high relief, open hills with low relief, open hills with high relief, closed hills with a moderate relief and low mountains with a high relief.

General:
Vegetation types are equally diverse and include a variety of Grassland types, Bushveld types, Thicket types and Afromontane Forest. The most prominent amongst these are Moist Upland Grassland. A range of rivers such as, Mgeni, Mzimvubu, Mkomazi, Mzimkulu and Groot Kei traverses this region. Perennial tributaries of these rivers are also common.

- Mean annual precipitation: Generally high.
- Coefficient of variation of annual precipitation: Mostly moderate to low.
- Drainage density: Medium in the north, tending towards low in the south.
- Stream frequency: Low to medium in the south, tending towards medium high in the north.
- Slopes <5%: <20% (central areas), 20-50% (northern areas) and 50-80% (southern areas).
- Median annual simulated runoff: Moderate to high.
- Mean annual temperature: Moderate to moderately high.

Size = 54091.1 km²

Table 16: Main attributes of the South Eastern Uplands Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>South Eastern Uplands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology; Broad division</td>
<td>Plain Low Relief (limited); Plains moderate Relief; Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills; Lowlands; Mountains; Moderate to High Relief; Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>(dominant types) (Primary)</td>
<td></td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold)</td>
<td>Coast Hinterland Bushveld; Eastern Thorn Bushveld; Subarid Thorn Bushveld (very limited); Short Mistbelt Grassland; North Eastern Mountain Grassland; Moist Upland Grassland; Coastal Grassland (very limited); South Eastern Mountain Grassland (very limited); AltıMountain Grassland (very limited); Patches Afromontane Forest</td>
</tr>
<tr>
<td>(Secondary)</td>
<td></td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>300-500 (limited), 500-1700, 1700-2300 (limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>500 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 30</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>15 to 60</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to very late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>10 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>20 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>12 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>8 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>40 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 17: NORTH EASTERN COASTAL BELT

Primary boundary determinants:
A diversity of terrain morphological types occurs with closed hills and mountains with a moderate to high relief being the most definitive.

General:
Altitude varies from sea level to 700 m.a.m.s.l. Vegetation types consist of Valley Thicket and a variety of Grassland and Bushveld types. Rivers such as the Mgeni, Mkomazi and Mzimkulu flow through this region.

- Mean annual precipitation: Predominantly high.
- Coefficient of variation of annual precipitation: Low to very low.
- Drainage density: Medium to high.
- Stream frequency: Medium/high to very high.
- Slopes <5%: Predominantly <20%.
- Median annual simulated runoff: High.
- Mean annual temperature: High.

Size = 12476.8 km²

Table 17: Main attributes of the North Eastern Coastal Belt Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>North Eastern Coastal Belt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains: Low Relief (limited); Plains: Moderate Relief (limited); Closed Hills, Mountains; Moderate and High Relief; Table Lands; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>Coastal Bushveld/Grassland; Coast Hinterland Bushveld; Coastal Grassland; Subarid Thorn Bushveld; Valley Thicket; Short Mistbelt Grassland (limited); Patches Coastal forest and Patches Afromontane Forest</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Secondary)</td>
<td>0-700</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>700 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 30</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>15 to 50</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>16 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>24 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>18 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to &gt;20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>4 to &gt;10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>60 to &gt;250</td>
</tr>
</tbody>
</table>
Primary boundary determinants:

Lowlands, hills and mountains with moderate and high relief, and closed hills and mountains with moderate and high relief, are characteristic of this region. South Eastern Mountain Grassland and Eastern Mixed Nama Karoo are the dominant vegetation types.

General:

The Great Fish River is the prominent river in the region.

- Mean annual precipitation: Generally low.
- Coefficient of variation of annual precipitation: Moderately high to high.
- Drainage density: Low but medium in some areas.
- Stream frequency: Low/medium to medium high.
- Slopes <5%: Varies from <20% to 50-80%.
- Median annual simulated runoff: Mostly low to moderate.
- Mean annual temperature: Moderate to high.

Size = 62675 km²

Table 18: Main attributes of the Drought Corridor Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>DROUGHT CORRIDOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division</td>
<td>Plains; Low Relief (very limited);</td>
</tr>
<tr>
<td>(dominant types in bold) (Primary)</td>
<td>Plains Moderate Relief (limited);</td>
</tr>
<tr>
<td></td>
<td>Lowlands; Hills and Mountains; Moderate and High Relief;</td>
</tr>
<tr>
<td></td>
<td>Open Hills; Lowlands; Mountains; Moderate to High Relief;</td>
</tr>
<tr>
<td></td>
<td>Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Dry Sandy Highveld Grassland; South Eastern Mountain</td>
</tr>
<tr>
<td></td>
<td>Grassland; Moist Upland Grassland;</td>
</tr>
<tr>
<td></td>
<td>Subarid Thorn Bushveld; Eastern Thorn Bushveld;</td>
</tr>
<tr>
<td></td>
<td>Eastern Mixed Nama Karoo; Central Nama Karoo (limited);</td>
</tr>
<tr>
<td></td>
<td>Upper Nama Karoo; Valley Thicket (limited); Xeric Succulent Thicket;</td>
</tr>
<tr>
<td></td>
<td>Patches Afromontane Forest</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (modifying)</td>
<td>100-300 (limited), 300-1900, 1900-2100 (limited)</td>
</tr>
<tr>
<td>MAP (mm) (Secondary)</td>
<td>100 to 500, 500-700 (limited)</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>20 to 40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>15 to 455</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Late to very late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>22 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>10 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>8 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>-2 to 10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for</td>
<td>&lt;5 to 100; 100 to 150 (limited)</td>
</tr>
</tbody>
</table>
ECOREGION 19: SOUTHERN FOLDED MOUNTAINS

Primary boundary determinants:
This region has a diverse topography but closed hills and mountains with a moderate to high relief, are dominant.

General:
The vegetation is likewise highly diverse with various Fynbos, Karoo, Renosterveld and Thicket types, but Mountain Fynbos, Grassy Fynbos and Little Succulent Karoo are generally distinctive. The Gourits River and its main tributaries traverse this area. Other significant rivers include the Palmiet, Gamtoos and its tributaries, Keurbooms, Kromme, Rivier-Sonder-End and the Breede rivers. The Berg River has its source in this region.

- Mean annual precipitation: Generally low but moderate to high towards the south.
- Coefficient of variation of annual precipitation: Moderate to high.
- Drainage density: Predominantly medium but low in some areas.
- Stream frequency: Medium/high to low/medium.
- Slopes <5%: Mostly <20%.
- Median annual simulated runoff: Varies from low to very high but predominantly moderate.
- Mean annual temperature: Moderate but low in patches.

Size = 49394.7 km²

Table 19: Main attributes of the Southern Folded Mountains Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Southern Folded Mountains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief (limited); Plains Moderate Relief (limited); Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills; Lowlands; Mountains; Moderate to High Relief; Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>Patches Afromontane Forest; Xeric Succulent Thicket (limited); Valley Thicket (limited); Spekboom Succulent Thicket; <strong>Grassy Fynbos; Mountain Fynbos</strong>; Limestone Fynbos; Sand Plain Fynbos (Limited); South and South West Coast Renosterveld; Central Mountain Renosterveld; West Coast Renosterveld (very limited) Eastern MixedNama Karoo; Central Nama Karoo; Great Nama Karoo (limited); Eastern Thorn Bushveld (very limited); <strong>Little Succulent Karoo</strong>; Lowland Succulent Karoo (very limited);</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Primary)</td>
<td>0-300 limited; 300-1900, 1900-2100 (limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>100 to 1500</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>&lt;15 to 55</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Very late summer to winter to all year</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>18 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>10 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Main Attributes</td>
<td>Southern Folded Mountains</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 20: SOUTH EASTERN COASTAL BELT

Primary boundary determinants:
Although plains occur in this region, closed hills and mountains primarily characterize the topography with a moderate to high relief. Altitude varies mostly from sea level to 500 m.a.m.s.l. Fynbos, Renosterveld, Grassland, and Thicket vegetation types occur, but the dominant types are Afromontane Forest and Mesic Succulent Thicket.

General:
The Swartkops, Gamtoos and Keurbooms Rivers flow through this region.

- Mean annual precipitation: Moderate to high.
- Coefficient of variation of annual precipitation: Low to moderate.
- Drainage density: Low to medium.
- Stream frequency: Low/medium to medium/high in limited areas.
- Slopes <5%: >80% but significant areas <20%.
- Median annual simulated runoff: Moderate to very high.
- Mean annual temperature: Moderate to moderately hot.

Size = 13084.5 km²

Table 20: Main attributes of the South Eastern Coastal Belt Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>SOUTH EASTERN COASTAL BELT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief (limited); Plains Moderate Relief; Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Dune Thicket; Mesic Succulent Thicket; Valley Thicket; Xeric Succulent Thicket Coastal Grassland; Eastern Thorn Bushveld; Grassy Fynbos (limited); Mountain Fynbos; South and South West Coast Renosterveld; Afromontane Forest</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (primary)</td>
<td>0-500; 500-1300 limited</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>300 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>&lt;15 to 30</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>All year to very late summer, to winter</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>22 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>12 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>10 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>2 to 10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>10 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 21: GREAT KAROO

Primary boundary determinants:
Plains with low to moderate relief are often distinctive, but significant areas with closed hills and mountains with moderate to high relief are present. Prominent escarpments occur in the north and northwest. Vegetation consists of a diversity of Nama Karoo, Succulent Karoo, Renosterveld and Thicket types, but the dominant types are Central Nama Karoo and Great Nama Karoo.

General:
Rivers such as the Doring, Upper tributaries of the Gourits and Gamtoos flow through this region.

- Mean annual precipitation: Arid to low.
- Coefficient of variation of annual precipitation: High but very high in areas.
- Drainage density: Varies from low to medium to high.
- Stream frequency: Low/medium, medium/high to high.
- Slopes <5%: Varies from <20% to >80%.
- Median annual simulated runoff: Very low to low.
- Mean annual temperature: Moderate to moderately high.

Size = 63743.8 km²

Table 21: Main attributes of the Great Karoo Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>GREAT KAROO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division</td>
<td>Plains; Low Relief; Plains Moderate Relief; Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills, Lowlands; Mountains; Moderate to High Relief; Closed Hills; Mountains; Moderate and High Relief; Table-Lands: Moderate and High Relief</td>
</tr>
<tr>
<td>(dominant types in bold) (Primary)</td>
<td></td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold)</td>
<td>Valley Thicket (limited); Spekboom Succulent Thicket (limited); Central Nama Karoo; Eastern Mixed Nama Karoo (limited); Great Nama Karoo; Upper Nama Karoo; Bushmanland Nama Karoo (limited) Lowland Succulent Karoo; Upland Succulent Karoo; Little Succulent Karoo (limited) Escarpment Mountain Renosterveld;</td>
</tr>
<tr>
<td>(Primary)</td>
<td></td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>100-300 (limited), 300-1700; 1700-1900 limited</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>0 to 500</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>30 to &gt;40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>15 to 65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Very late summer to all year</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>26 to &gt;32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>12 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>10 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 8</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 to 40; 40 to 60 (limited)</td>
</tr>
</tbody>
</table>
ECOREGION 22: SOUTHERN COASTAL BELT

Primary boundary determinants:
Closed hills and mountains with moderate to high relief are characteristic but plains are also significant. South and Southwest Coast Renosterveld dominate vegetation. Altitude varies from sea level to 700 m.a.m.s.l.

General:
Rivers such as the Gourits, Breede and Sout flow through this region. Several short coastal rivers rise here.

- Mean annual precipitation: Moderate.
- Coefficient of variation of annual precipitation: Mostly moderate/high.
- Drainage density: Low to medium.
- Stream frequency: Low/medium to medium/high.
- Slopes <5%: <20% and >80%
- Median annual simulated runoff: Moderate.
- Mean annual temperature: Moderate/high.

Size = 15387.2 km²

Table 22: Main attributes of the Southern Coastal Belt Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>SOUTHERN COASTAL BELT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant</td>
<td>Plains; Low Relief;</td>
</tr>
<tr>
<td>types in bold) (Primary)</td>
<td>Plains Moderate Relief;</td>
</tr>
<tr>
<td></td>
<td>Open Hills; Lowlands; Mountains; Moderate to High</td>
</tr>
<tr>
<td></td>
<td>Relief;</td>
</tr>
<tr>
<td></td>
<td>Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold)</td>
<td>South and South West Coast Renosterveld; Central</td>
</tr>
<tr>
<td>(Secondary)</td>
<td>Mountain Renosterveld; Limestone fynbos; Mountain</td>
</tr>
<tr>
<td></td>
<td>Fynbos; Laterite Fynbos (limited);</td>
</tr>
<tr>
<td></td>
<td>Dune Thicket;</td>
</tr>
<tr>
<td></td>
<td>Patches Afromontane Forest</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Primary)</td>
<td>0-700; 700-1500 (limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>300 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual</td>
<td>&lt;20 to 40</td>
</tr>
<tr>
<td>precipitation)</td>
<td></td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>&lt;15 to 50</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Winter to all year</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C); February</td>
<td>22 to 30</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C); July</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C); February</td>
<td>10 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C); July</td>
<td>4 to 10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for</td>
<td>10 to &gt;250</td>
</tr>
<tr>
<td>quaternary catchment</td>
<td></td>
</tr>
</tbody>
</table>
ECOREGION 23: WESTERN FOLDED MOUNTAINS

Primary boundary determinants:
Tablelands and plains are present but closed hills and mountains with moderate to high relief are distinctive. Prominent escarpments occur along the east and north west of the region.

General:
Mountain fynbos is the dominant vegetation type. The Olifants and Breede rivers rise in this region.

- Mean annual precipitation: Varies from moderate/high in the south to low in the north.
- Coefficient of variation of annual precipitation: Mostly high.
- Drainage density: Low to medium.
- Stream frequency: Mostly medium/high but low/medium in patches.
- Slopes <5%: <20% but >80% in limited areas.
- Median annual simulated runoff: Very high in the south to moderate/low in the north.
- Mean annual temperature: Moderate/low to moderate high.

Size = 15159.3 km²

Table 23: Main attributes of the Western Folded Mountains Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Western Folded Mountains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief (limited); Plains Moderate Relief (limited); Lowlands; Hills and Mountains; Moderate and High Relief; Closed Hills; Mountains; Moderate and High Relief; Table-Lands: Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>Mountain Fynbos; Central Mountain Renosterveld; West Coast Renosterveld (very limited); Little Succulent Karoo; Upland Succulent Karoo (very limited); Strandveld Succulent Karoo (very limited) Central Nama Karoo (1 patch);</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>100-300 (limited), 300-1700, 1700-2500 (limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>100 to 1500</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>30 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Winter</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>18 to &gt;32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>8 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 8</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 (limited); 5 to &gt;250</td>
</tr>
</tbody>
</table>
ECOREGION 24: SOUTH WESTERN COASTAL BELT

Primary boundary determinants:
Plains with a moderate to low relief are characteristic of the region. Altitude varies from sea level to 900 m a.m.s.l. Although significant areas of Fynbos, Succulent Karoo and Thicket occur, the dominant vegetation type is West Coast Renosterveld.

General:
The Berg and Diep rivers flow through this region.

- Mean annual precipitation: Moderate in a limited area in the south, decreasing to low in the north.
- Coefficient of variation of annual precipitation: Moderate/high in the north with a restricted area being low in the south.
- Drainage density: Low.
- Stream frequency: Low/medium.
- Slopes <5%: Predominantly >80%.
- Median annual simulated runoff: Very low in the north to moderate/high in the south.
- Mean annual temperature: Moderate/high.

Size = 14628.4 km²

Table 24: Main attributes of the South Western Coastal Belt Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>South Western Coastal Belt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant</td>
<td>Plains; Low Relief;</td>
</tr>
<tr>
<td>types in bold) (Primary)</td>
<td>Plains Moderate Relief;</td>
</tr>
<tr>
<td></td>
<td>Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td></td>
<td>Sand Plain Fynbos; Mountain Fynbos; West Coast Renosterveld;</td>
</tr>
<tr>
<td></td>
<td>Dune Thicket; Strandveld Succulent Karoo</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold)</td>
<td>0-300; 300-900 limited</td>
</tr>
<tr>
<td>(Primary)</td>
<td>20 to &gt;250</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>&lt;20 to 40</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>30 to 60</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual</td>
<td>Winter</td>
</tr>
<tr>
<td>precipitation)</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>24 to 32</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean annual temp. (°C): February</td>
<td>12 to 18</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>4 to 10</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): July</td>
<td>10 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): February</td>
<td>&lt;5; 20 to &gt;250</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td></td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for</td>
<td></td>
</tr>
<tr>
<td>quaternary catchment</td>
<td></td>
</tr>
</tbody>
</table>
ECOREGION 25: WESTERN COASTAL BELT

Primary boundary determinants:
Plains with low and moderate relief are typical of this region.

General:
Altitude varies from sea level to 700 m.a.m.s.l. Vegetation types consist of Succulent Karoo types. The Olifants, Doring, Sout, Groen and Buffalo rivers traverse this region while the Orange River flows through the northern part.

- Mean annual precipitation: Very low/arid.
- Coefficient of variation of annual precipitation: High to very high.
- Drainage density: Low.
- Stream frequency: Low/medium.
- Slopes <5%: >80%.
- Median annual simulated runoff: Very low.
- Mean annual temperature: Moderate/high.

Size = 20398.8 km²

Table 25: Main attributes of the Western Coastal Belt Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Western Coastal Belt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (primary)</td>
<td>Plains; Low Relief; Plains Moderate Relief; Closed Hills; Mountains: Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>Lowland Succulent Karoo; Upland Succulent Karoo (limited); Strandveld Succulent Karoo Mountain Fynbos (limited)</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Secondary)</td>
<td>0-700, 700-1100 (limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>0 to 200</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>30 to &gt;40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>45 to 65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Winter</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>16 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>24 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>16 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>2 to 10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5, 20-40 (limited)</td>
</tr>
</tbody>
</table>
ECOREGION 26: NAMA KAROO

Primary boundary determinants:

Topography is diverse but plains with a moderate to high relief and lowlands, hills and mountains with moderate to high relief are dominant. Vegetation consists almost exclusively of Nama Karoo types.

General:

Perennial rivers that traverse this region are the Riet and Orange. Rivers draining extensive parts of the region, such as the Hartbees, are seasonal.

- Mean annual precipitation: Moderate/low in the east, decreasing to arid in the west.
- Coefficient of variation of annual precipitation: Moderate/high in the east to very high in the west.
- Drainage density: Generally low, but medium to high in some parts.
- Stream frequency: Low/medium but significant areas with low/high and high frequencies.
- Slopes <5%: Mostly >80% to 50-80%, but significant areas with 20-50% and <20%.
- Median annual simulated runoff: Moderate/low in the east, decreasing to arid in the west.
- Mean annual temperature: Moderate/low in the east, increasing to moderate/high in the west.

Size = 234554.2 km²

Table 26: Main attributes of the Nama Karoo Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Nama Karoo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; Plains Moderate Relief; Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills, Lowlands, Mountains; Moderate to High Relief; Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Eastern Mixed Nama Karoo; Upper Nama Karoo; Bushmanland Nama Karoo; Orange River Nama Karoo; Great Nama Karoo (very limited); Lowland Succulent Karoo (limited); Upland Succulent Karoo Escarpment Mountain Renosterveld</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>300-1700, 1700-1900 (limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>0 to 500</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>30 to &gt;40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>15 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Late to very late summer to Winter</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>26 to &gt;32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>10 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>12 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 6</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 to 60</td>
</tr>
</tbody>
</table>
ECOREGION 27: NAMAQUA HIGHLANDS

Primary boundary determinants:
Closed hills and mountains with moderate to high relief are distinctive in this region. Dominant vegetation types consist of Succulent Karoo types and Renosterveld.

General:
The Buffalo and Groen rivers have their sources in the region while Orange River flows through the northern part.

- Mean annual precipitation: Predominantly arid.
- Coefficient of variation of annual precipitation: High, very high in the north.
- Drainage density: Medium.
- Stream frequency: Medium/high.
- Slopes <5%: <20%.
- Median annual simulated runoff: Very low to low.
- Mean annual temperature: Moderate to moderately high.

Size = 21743.7 km²

Table 27: Main attributes of the Namaqua Highlands Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Namaqua Highlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief (limited); Closed Hills, Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Bushmanland Nama Karoo (limited); Upland Succulent Karoo; Lowland Succulent Karoo; North West Mountain Renosterveld; Patches Mountain Fynbos</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>100-1300; 1300-1500 limited</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>0 to 200</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>30 to &gt;40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>30 to 65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Winter</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>12 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>22 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>12 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>12 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>2 to 8</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 to 10; 20 to 40</td>
</tr>
</tbody>
</table>
ECOREGION 28: ORANGE RIVER GORGE

Primary boundary determinants:
Closed hills and mountains with a moderate to high relief characterises the topography. Orange River Nama Karoo is the dominant vegetation type.

General:
This ecoregion is situated along the lower section of the Orange River. No perennial streams rise in this region.

- Mean annual precipitation: Arid.
- Coefficient of variation of annual precipitation: Very high.
- Drainage density: Medium.
- Stream frequency: Medium high.
- Slopes <5%: <20%.
- Median annual simulated runoff: Very low.
- Mean annual temperature: High.

Size = 8435.3 km²

Table 28: Main attributes of the Orange River Gorge Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Orange River Gorge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains Low Relief (limited); Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary NBI)</td>
<td>Upland Succulent Karoo; Orange River Nama Karoo</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>0-1100</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>0 to 100</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>35 to &gt;40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>30 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Very late summer to winter</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>16 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>30 to &gt;32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>16 to 24</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>2 to 10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5</td>
</tr>
</tbody>
</table>
ECOREGION 29: SOUTHERN KALAHARI

Primary boundary determinants:
Vegetation consists of a variety of Kalahari Bushveld types.

General:
Terrain morphological types consist of plains with low to moderate relief in the east, and open hills, lowlands and mountains with moderate to high relief in the west. The western part of the region consists of dune hills. The lower part of the Vaal River flows through the region, while others such as the Harts, Molopo, Kuruman and Nosob are seasonal.

- Mean annual precipitation: Moderate/low in the east, decreasing to arid in the west.
- Coefficient of variation of annual precipitation: Moderate/high in the east to very high in the west.
- Drainage density: Low in the east to medium in the west.
- Stream frequency: generally low/medium, but with patches medium/high.
- Slopes <5%: Generally >80 in the east, >20-50% in the west with patches <20%.
- Median annual simulated runoff: Low/moderate in the east to very low in the west.
- Mean annual temperature: Moderate/high to high.

Size = 152829.6 km²

Table 29: Main attributes of the Southern Kalahari Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Southern Kalahari</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Secondary)</td>
<td>Plains; Low Relief; Plains Moderate Relief; Lowlands; Hills and Mountains; Moderate and High Relief (limited) Open Hills, Lowlands; Mountains; Moderate to High Relief; Closed Hills; Mountains; Moderate and High Relief</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Orange River Nama Karoo (limited); Karroid Kalahari Bushveld; Shrubby Kalahari Dune Bushveld; Thorny Kalahari Dune Bushveld (limited); Kalahari Mountain Bushveld; Kalahari Plains Thorn Bushveld; Kalahari Plateau Bushveld; Kimberley Thorn Bushveld</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (modifying)</td>
<td>500-1700; 1700-1900 limited</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>0 to 500</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>30 to &gt;40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>50 to &gt;65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Mid to very late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>14 to 22</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>28 to &gt;32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>14 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to 20</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>-2 to 4</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 to 60</td>
</tr>
</tbody>
</table>
ECOREGION 30: GHAAP PLATEAU

Primary boundary determinants:
This is an extensive dolomitic area characterized by plains with a low to moderate relief. A distinctive escarpment occurs along the east of the region. Kalahari Bushveld types are distinctive with Kalahari Plateau Bushveld being the most prominent.

General:
The Kuruman River has its source in the region.

- Mean annual precipitation: Moderate/low.
- Coefficient of variation of annual precipitation: Moderate high.
- Drainage density: Low.
- Stream frequency: Low/medium.
- Slopes <5%: >80%.
- Median annual simulated runoff: Moderate/low.
- Mean annual temperature: Moderate/high to high.

Size = 21326.6 km²

Table 30: Main attributes of the Ghaap Plateau Ecoregion.

<table>
<thead>
<tr>
<th>Main Attributes</th>
<th>Ghaap Plateau</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains; Low Relief; Plains Moderate Relief; Closed Hills; Mountains; Moderate and High Relief (limited)</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Primary)</td>
<td>Kalahari Plateau Bushveld; Kimberly Thorn Bushveld; Kalahari Mountain Bushveld (limited); Kalahari Plains Thorn Bushveld</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (secondary)</td>
<td>900-1700</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>200 to 500</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>30 to 40</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>55 to 65</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Mid to late summer</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>16 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>28 to 32</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>16 to 20</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to 18</td>
</tr>
<tr>
<td>Mean daily min temp. (°C): July</td>
<td>0 to 2</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>&lt;5 to 40</td>
</tr>
</tbody>
</table>
ECOREGION 31: EASTERN COASTAL BELT

Primary boundary determinants:
The main terrain morphological type in this region is closed hills and mountains with a moderate to high relief.

General:
Altitude varies from sea level to 700 m.a.m.s.l. Vegetation types consist of a variety of Thicket, Grassland and Bushveld types. Rivers such as the Mzimvubu and Groot Kei flow through this region.

- Mean annual precipitation: Predominantly high.
- Coefficient of variation of annual precipitation: Low to very low.
- Drainage density: Medium to high.
- Stream frequency: Medium/high to very high.
- Slopes <5%: Predominantly <20%.
- Median annual simulated runoff: High.
- Mean annual temperature: Moderate.

Size = 12058.4 km²

Table 31: Main attributes of the Eastern Coastal Belt Ecoregion.

<table>
<thead>
<tr>
<th>MAIN ATTRIBUTES</th>
<th>EASTERN COASTAL BELT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Morphology: Broad division (dominant types in bold) (Primary)</td>
<td>Plains: Moderate Relief (limited); Closed Hills, Mountains; Moderate and High Relief;</td>
</tr>
<tr>
<td>Vegetation types (dominant types in bold) (Secondary)</td>
<td>Coastal Bushveld/Grassland (Limited); Eastern Thorn Bushveld; Valley Thicket; Dune Thicket (limited); Short Mistbelt Grassland (limited); Coastal Grassland Patches Coastal forest and Patches Afromontane Forest</td>
</tr>
<tr>
<td>Altitude (m a.m.s.l) (Secondary)</td>
<td>0-500, 500-900 (limited)</td>
</tr>
<tr>
<td>MAP (mm) (modifying)</td>
<td>400 to 1000</td>
</tr>
<tr>
<td>Coefficient of Variation (% of annual precipitation)</td>
<td>&lt;20 to 35</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>&lt;15 to 50</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>Early to very late summer to all year</td>
</tr>
<tr>
<td>Mean annual temp. (°C)</td>
<td>16 to 20</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): February</td>
<td>24 to 28</td>
</tr>
<tr>
<td>Mean daily max. temp. (°C): July</td>
<td>18 to 22</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): February</td>
<td>14 to 20</td>
</tr>
<tr>
<td>Mean daily min. temp. (°C): July</td>
<td>4 to &gt;10</td>
</tr>
<tr>
<td>Median annual simulated runoff (mm) for quaternary catchment</td>
<td>20 to &gt;250</td>
</tr>
</tbody>
</table>
REFERENCES


### APPENDIX:

#### List of maps:

<table>
<thead>
<tr>
<th>Map Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I ecoregion boundaries (outlines)</td>
<td>b</td>
</tr>
<tr>
<td>Major rivers and preliminary Level I ecoregions boundaries</td>
<td>c</td>
</tr>
<tr>
<td>Major roads, towns and preliminary Level I ecoregions boundaries</td>
<td>d</td>
</tr>
<tr>
<td>Geology Map of South Africa, Lesotho and Swaziland</td>
<td>e</td>
</tr>
<tr>
<td>Terrain morphology</td>
<td>f</td>
</tr>
<tr>
<td>Terrain morphology (broad division)</td>
<td>g</td>
</tr>
<tr>
<td>Altitude</td>
<td>h</td>
</tr>
<tr>
<td>Percentage areas with slopes &lt; 5%</td>
<td>i</td>
</tr>
<tr>
<td>Vegetation of South Africa, Swaziland &amp; Lesotho</td>
<td>j</td>
</tr>
<tr>
<td>Vegetation of South Africa, Lesotho and Swaziland (NBI)</td>
<td>k</td>
</tr>
<tr>
<td>Mean annual precipitation</td>
<td>l</td>
</tr>
<tr>
<td>Coefficient of variation (%) of annual precipitation</td>
<td>m</td>
</tr>
<tr>
<td>Rainfall concentration index</td>
<td>n</td>
</tr>
<tr>
<td>Rainfall seasonality</td>
<td>o</td>
</tr>
<tr>
<td>Mean annual temperature</td>
<td>p</td>
</tr>
<tr>
<td>Means of daily maximum temperature (February)</td>
<td>q</td>
</tr>
<tr>
<td>Means of daily maximum temperature (July)</td>
<td>r</td>
</tr>
<tr>
<td>Means of daily minimum temperature (February)</td>
<td>s</td>
</tr>
<tr>
<td>Means of daily minimum temperature (July)</td>
<td>t</td>
</tr>
<tr>
<td>Median simulated annual runoff</td>
<td>u</td>
</tr>
<tr>
<td>Stream frequency</td>
<td>v</td>
</tr>
<tr>
<td>Drainage density</td>
<td>w</td>
</tr>
<tr>
<td>Soil zones</td>
<td>x</td>
</tr>
<tr>
<td>Explanatory table for soil zones</td>
<td>y</td>
</tr>
</tbody>
</table>
Preliminary Level I River Ecoregional classification System for South Africa

Department of Water Affairs and Forestry

September 2005
Preliminary Level I River Ecoregional classification System for South Africa

Department of Water Affairs and Forestry

September 2005
Preliminary Level I River Ecoregional classification System for South Africa

KEY

<table>
<thead>
<tr>
<th>Level 1 Ecoregion boundaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Daily Minimum Temperature - July</td>
</tr>
<tr>
<td>&lt; -2</td>
</tr>
<tr>
<td>-2 - 0</td>
</tr>
<tr>
<td>0 - 2</td>
</tr>
<tr>
<td>2 - 4</td>
</tr>
<tr>
<td>4 - 6</td>
</tr>
<tr>
<td>6 - 8</td>
</tr>
<tr>
<td>8 - 10</td>
</tr>
<tr>
<td>&gt; 10</td>
</tr>
</tbody>
</table>


Department of Water Affairs and Forestry
September 2005
Preliminary Level I River Ecoregional classification System for South Africa

Department of Water Affairs and Forestry

September 2005
<table>
<thead>
<tr>
<th>Soil Zone</th>
<th>Soil Depth</th>
<th>Texture Class</th>
<th>Soil Form/Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt;900</td>
<td>SaCl</td>
<td>Av35</td>
</tr>
<tr>
<td>1a</td>
<td>200-450</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>2</td>
<td>500-1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>3</td>
<td>900-1200</td>
<td>SaCl</td>
<td>Av36</td>
</tr>
<tr>
<td>4</td>
<td>450-850</td>
<td>SaCl</td>
<td>Av36</td>
</tr>
<tr>
<td>5</td>
<td>500-900</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>5a</td>
<td>300-700</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>6</td>
<td>150-400</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>6a</td>
<td>&gt;900</td>
<td>SaCl</td>
<td>Av35</td>
</tr>
<tr>
<td>7</td>
<td>600-1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>7a</td>
<td>300-500</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>8</td>
<td>500-1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>8a</td>
<td>500-900</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>8b</td>
<td>400-800</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>9</td>
<td>750-1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>10</td>
<td>800-1200</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>11</td>
<td>100-400</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>12</td>
<td>450-1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>13</td>
<td>500-900</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>14</td>
<td>450-850</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>15</td>
<td>&gt;1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>16</td>
<td>&gt;1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>17</td>
<td>300-800</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>18</td>
<td>400-1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>19</td>
<td>450-1000</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>20</td>
<td>150-450</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>21</td>
<td>200-500</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>22</td>
<td>400-800</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>23</td>
<td>&gt;900</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>24</td>
<td>200-700</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>25</td>
<td>600-900</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>26</td>
<td>300-600</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
<tr>
<td>27</td>
<td>300-600</td>
<td>SaLm</td>
<td>Ms10</td>
</tr>
</tbody>
</table>
## Preliminary Level I River Ecoregional classification System for South Africa

**Department of Water Affairs and Forestry**  
**September 2005**

<table>
<thead>
<tr>
<th>Soil Zone</th>
<th>Soil Depth</th>
<th>Soil Texture Class</th>
<th>Soil Form/Series</th>
<th>Code %</th>
<th>Code %</th>
<th>Code %</th>
<th>Code %</th>
<th>Code %</th>
<th>Code %</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>450-900</td>
<td>100</td>
<td>SaClLm</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28a</td>
<td>100-300</td>
<td>60</td>
<td>450-900</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>100-300</td>
<td>80</td>
<td>500-1000</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>100-300</td>
<td>60</td>
<td>500-800</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>300-600</td>
<td>50</td>
<td>500-1000</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>200-500</td>
<td>75</td>
<td>500-900</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>100-400</td>
<td>70</td>
<td>450-800</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>100-300</td>
<td>35</td>
<td>450-900</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>200-450</td>
<td>25</td>
<td>450-900</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>100-350</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36a</td>
<td>50-300</td>
<td>60</td>
<td>450-900</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>&gt;900</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37a</td>
<td>100-300</td>
<td>20</td>
<td>300-1000</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>&gt;900</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>400-500</td>
<td>80</td>
<td>600-1000</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>200-500</td>
<td>70</td>
<td>600-1000</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>200-500</td>
<td>60</td>
<td>600-900</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>100-400</td>
<td>25</td>
<td>450-900</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>100-400</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>100-400</td>
<td>60</td>
<td>400-800</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>200-500</td>
<td>70</td>
<td>500-1000</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>300-600</td>
<td>70</td>
<td>700-1200</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46a</td>
<td>50-200</td>
<td>80</td>
<td>400-900</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>50-300</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>100-400</td>
<td>80</td>
<td>400-900</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>100-350</td>
<td>60</td>
<td>400-800</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>300-600</td>
<td>30</td>
<td>600-1000</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>&gt;900</td>
<td>80</td>
<td>500-900</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>100-400</td>
<td>35</td>
<td>400-800</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>100-350</td>
<td>70</td>
<td>500-900</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>200-500</td>
<td>70</td>
<td>500-1000</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>450-900</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>100-450</td>
<td>60</td>
<td>450-900</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>&lt;400</td>
<td>20</td>
<td>400-900</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>450-900</td>
<td>40</td>
<td>&gt;900</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>450-900</td>
<td>65</td>
<td>&gt;900</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>450-900</td>
<td>100</td>
<td>SaClLm</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>450-900</td>
<td>20</td>
<td>&gt;900</td>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>&gt;1000</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>450-900</td>
<td>40</td>
<td>&gt;900</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Preliminary Level I River Ecoregional Classification System for South Africa

<table>
<thead>
<tr>
<th>Soil Zone</th>
<th>Soil Depth</th>
<th>Texture Class</th>
<th>Soil Form/Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>100-200</td>
<td>SaCl-Lm-SaCl</td>
<td>Hu33/Hu36</td>
</tr>
<tr>
<td>65</td>
<td>&gt;900</td>
<td>SaCl-Cl</td>
<td>Ar40</td>
</tr>
<tr>
<td>66</td>
<td>400-900</td>
<td>SaCl-Lm</td>
<td>Sd11</td>
</tr>
<tr>
<td>67</td>
<td>400-900</td>
<td>SaCl-Cl</td>
<td>Va31/Va41</td>
</tr>
</tbody>
</table>