Delineation of river types for rivers of Mpumalanga, South Africa: establishing a spatial framework for selection of reference sites

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> For client: Institute for Water Quality Studies, DWAF

Executive Summary

The implementation design phase of the National Aquatic Ecosystem Biomonitoring Programme (NAEBP) was initiated in August 1997. This programme, subsequently renamed the River Health Programme (RHP), consists of four portfolios each focusing on different aspects of river health such as communication (including stakeholder and grassroots communication); capacity building; research, development and funding; and training. In addition to these general portfolios, each province of South Africa is represented by a regional "champion" who is responsible for the initiation of biomonitoring within their province. The overall objective of the RHP is to develop the procedures and infrastructures for implementation and ongoing maintenance of biomonitoring on a national scale.

Within the research and development component, attention has focused on establishing a method for the derivation of ecological reference conditions. The need for such a reference condition or established benchmark with which monitoring information can be compared, has been expressed on several occasions by organisations involved in biomonitoring. Reference conditions enable the degree of degradation or deviation from natural conditions to be ascertained. South Africa has a varied climate (and hence hydrological type), geology (and hence water chemistry) and geomorphology (and hence channel type, substratum composition, erosion potential). Variation in these factors, both among and within rivers, together with natural biogeographic differences in the distribution of riverine biota, may potentially lead to biotic differences. Such differences need to be taken into account when implementing a national biomonitoring programme and deriving ecological reference conditions. The establishment of a spatial framework facilitates the identification of ecologically-similar river types, for which ecological reference conditions can be derived.

This report is the first in a series of reports that focuses on the establishment of such reference conditions. Specifically, this report outlines the development and application of a spatial framework, and consists of a series of Geographical Information System (GIS) maps designed to assist with the identification of river types and the selection of reference sites. The focus is on the rivers of Mpumalanga, or rather DWAF primary catchments B and X, hereafter referred to as Mpumalanga region. Although reference conditions are being derived for Mpumalanga rivers, the methodologies developed may subsequently be transferred to other provinces.

A three-tiered hierarchical spatial framework has been applied, wherein level 1 is represented by ecoregions, level 2 by sub-regions or geomorphological zones and level 3 by river types. Ecoregions (Kleynhans *et al.* 1998a) for the Mpumalanga region are a refinement of the bioregions identified at a spatial framework workshop held in January 1996 (Brown *et al.* 1996). A top-down approach was followed, in which physical variables such as physiography, climate, geology, soils and potential natural vegetation were used to classify rivers into ecoregions. The assumption in an ecoregion approach is that instream features such as the distribution of the biota or water chemistry are intimately linked to these variables in the order in which they

were placed in the classification hierarchy (Eekhout *et al.* 1997). Verification of the level 1 ecoregions will need to be undertaken once more detailed information has been collected. It will most likely be an iterative process, with ecoregions becoming more refined over time. This is, however, outside the scope of the current project, although information collected during this project will contribute to verification of the ecoregions.

Level 2 in the hierarchy is that of longitudinal sub-regional division or geomorphological zonation. The zonation of the main rivers and tributaries of Mpumalanga region has enabled the identification of the geomorphological zones present in each of the represented ecoregions, and some indication has been attained as to the proportional representation of each zone within each ecoregion. Extrapolation from zoned rivers to ones for which geomorphological zonation is not yet known may be possible using the terrain morphology cover of the ENPAT97 series (Van Riet *et al.* 1997). This has not been done at this stage as it was beyond the scope of the report. However, complications are likely to arise where smaller rivers are concerned.

Level 3 in the hierarchy is the identification of river types, which is performed using factors such as river size, hydrological type (ephemeral, seasonal or perennial), geomorphological characteristics (channel type, substratum composition) and other chemical and biological factors. Initially the level 3 analysis was planned as a desktop exercise using available literature and local knowledge. The exercise, however, proved to be problematic because of limited responses from local experts and scant information. The type of information needed for this level of the hierarchy, such as river size, geomorphological and biological characteristics, is best collected in the field. It is therefore suggested that river types be identified as part of subsequent ground-truthing or field verification phases. Components incorporated in the ecoregions such as terrain morphology, vegetation and geology may also prove useful contributors to the identification of river types.

The Mpumalanga region has been graphically characterised in terms of bioregions (Brown *et al.* 1996), ecoregions (Kleynhans *et al.* 1998a), terrain morphology (Van Riet *et al.* 1997), potential natural vegetation (Low and Rebelo 1996) and geology (Vegter 1995). Subsequently, each DWAF secondary catchment has been graphically characterised in terms of ecoregions, geomorphological zones or sub-regions (main rivers and tributaries only), terrain morphology, vegetation and geology. This information, together with tabulated summary information of all named rivers at 1:250 000 or 1:500 000 scale provides details related to each river's "parent" river, level 1 ecoregion, vegetation type, geological or lithostratigraphic type and hydrological type.

Ecoregions, which incorporate physiography, climate, geology, soils and potential natural vegetation, therefore, facilitate the grouping of rivers at level 1 of the hierarchy. Geomorphological zones divided rivers at level 2 of the hierarchy. GIS maps of terrain morphology, potential natural vegetation and geology, together with information of hydrological type, contribute to identification of level 3 river types. Finalised river typing will, however, need to be done later at the field verification stage. It is within this framework

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1. Introduction

1.1 Background

The implementation design phase of the National Aquatic Ecosystem Biomonitoring Programme (NAEBP) was initiated in August 1997. This programme, subsequently renamed the River Health Programme (RHP), consists of four portfolios each focusing on different aspects of river health such as communication (including stakeholder and grassroots communication); capacity building; research, development and funding; and training. In addition to these general portfolios, each province of South Africa is represented by a regional "champion" who is responsible for the initiation of biomonitoring within their province. The overall objective of the RHP is to develop the procedures and infrastructures for implementation and ongoing maintenance of biomonitoring on a national scale.

Several organisations are using components of the biomonitoring programme depending on their particular objectives and spheres of expertise and interest. An aspect that has continually been raised in biomonitoring circles is that of reference conditions or an established benchmark with which monitoring information can be compared (see section 2.1). Southern Waters Ecological Research and Consulting cc, as part of the research and development component of the RHP, is focusing on establishing a method for the derivation of ecological reference conditions with particular attention being paid to invertebrate assemblages. This report is the first in a series of reports that focuses on such conditions and it outlines the development and application of a spatial framework designed to assist with the identification of river types and selection of reference sites.

The overall objective of the project, to derive ecological reference conditions for rivers of Mpumalanga (the study region), focused our attention on the Mpumalanga Province. However, in ecological terms the division of rivers on the basis of political regions is not particularly meaningful. The decision was therefore taken to include the entire area represented by Department of Water Affairs and Forestry (DWAF) primary drainage regions B and X at the level of spatial analysis. The Sabie, Crocodile and Olifants Rivers, which form the focus of the Mpumalanga State of the Rivers Project (Water Research Commission project K5/850/0/1), fall within these DWAF drainage regions. In future discussions within this report, when reference is made to Mpumalanga rivers, all rivers in DWAF regions B and X are being referred to. The location of these two DWAF drainage regions in relation to the boundaries of Mpumalanga and Northern Province are shown in Figure 1. B1, B2, B3, B4, B6, X1, X2, X3 and X4 fall largely or entirely within Mpumalanga Province, whilst B5, B7, B8 and B9 fall largely or entirely within Northern Province.

1.2 The purpose of this document

The purpose of this document is as follows:

- To outline developments with respect to the establishment of a spatial framework for rivers of Mpumalanga (DWAF drainage regions B and X)
- To discuss sources of information used, methodological aspects and problems experienced during this
 exercise
- To characterise the whole study region in terms of bioregions, ecoregions, terrain morphology, vegetation and geology
- To characterise each DWAF secondary catchment in terms of ecoregions, geomorphological zones or sub-regions (main rivers and tributaries only), terrain morphology, vegetation and geology
- To provide a summary table of all named rivers at 1:250 000 or 1:500 000 scale in Mpumalanga region detailing each river's "parent" river, level 1 ecoregion, vegetation type, geological or lithostratigraphic type and hydrological type

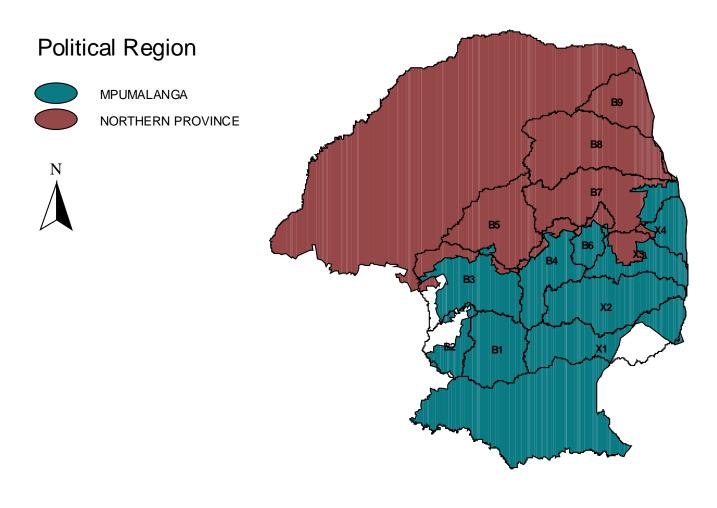


Figure 1. Department of Water Affairs and Forestry primary drainage regions B, comprising B1-B9 and X, X1-X4, in relation to the political provinces, Mpumalanga and Northern Province.

2. Development of a spatial framework

2.1 Introduction

Considerable work has been undertaken on the classification of South African rivers, each with their own set of objectives (e.g. Joubert & Hurly 1994, Brown et al. 1996, Eekhout et al. 1997, Day et al. 1998, Kleynhans et al. 1998a, b). In the context of deriving ecological reference conditions for use in a National Aquatic Ecosystem Biomonitoring Programme (NAEBP), it is important that the classification scheme divides the country in a logical and ecologically-meaningful way, so that variation among rivers in the country is best accounted for. South Africa has a varied climate (and hence hydrological type), geology (and hence water chemistry) and geomorphology (and hence channel type, substratum composition, erosion potential). Variation in these factors, both among and within rivers, together with natural biogeographic differences in the distribution of riverine biota, may potentially lead to biotic differences. Such differences need to be taken into account when implementing a national biomonitoring programme. The establishment of a spatial framework facilitates the identification of ecologically-similar river types, for which ecological reference conditions can be derived.

An ecological reference condition is the condition that is representative of a group of "least-impacted" or minimally disturbed habitats organised by selected physical, chemical and biological attributes (Reynoldson *et al.* 1997). This organisation refers to the spatial framework which would enable the characterisation of the physical, chemical and biological attributes of sites, reaches or rivers within a particular river type. In some instances this reference condition may represent the natural or intrinsic conditions of the water body whilst in others it may represent the "best available", for example in lowland rivers which have been subjected to extensive anthropogenic modification. Once the reference condition has been established for a particular river type, it forms the template against which assessments of the present ecological status or condition of sites, reaches or rivers of the same river type can be compared. In this way the degree of degradation or deviation from expected "natural" conditions can be ascertained.

A three-tiered hierarchical spatial framework was developed during a workshop of the NAEBP in January 1996 (Brown *et al.* 1996). During this workshop, the biogeographic regions of Eekhout *et al.* (1997) were modified into bioregions. Sub-regions, which were largely a reflection of the geomorphological nature or zonation of rivers, and which represent level 2 of the hierarchy, were also delineated. As the bioregions and sub-regions were derived on the basis of limited data and professional judgement, they required verification. Level 3, namely river types, which related to aspects such as river size, hydrological type, geomorphological, chemical and biological characteristics, were not identified at the workshop, but were recognised as being important. This spatial framework is discussed in more detail below and subsequent developments related to each aspect are outlined.

2.2 Level 1: Bioregions and Ecoregions

Bioregions (Brown *et al.* 1996) are a refinement of the biogeographic regions, which were based on broad historical distribution patterns of riverine macroinvertebrates, fish and riparian vegetation (Eekhout *et al.* 1997). The modifications to the biogeographic regions were made by specialists with a knowledge of macroinvertebrate, fish and/or riparian vegetation within each region. The team responsible for delineation of bioregions within the Mpumalanga region were Drs N. Kleynhans (Institute for Water Quality Studies) and J. Engelbrecht (Mpumalanga Parks Board). Subsequently, as part of the Ecological Reserve Project, a new Level 1 regional classification was proposed, namely ecoregions (Kleynhans *et al.* 1998a). Given that, for Mpumalanga, the ecoregions were a further refinement of the bioregions, it was decided to use this framework as the Level 1 classification of rivers of Mpumalanga. The bioregions and ecoregions in B and X primary drainage regions are presented in Figure 2. A second level of ecoregions has been delineated for the region using the same approach as for ecoregion level 1 (Figure 3, Kleynhans *et al.* 1998b). Details of the ecoregional approach, together with summary information of ecoregion level 1, are given below.

2.2.1 Components of the Ecoregion Classification

A top-down approach was used to classify South African rivers into ecoregions. This approach is generally one in which physical variables such as physiography, climate, geology and soils are used as criteria for classification. However, for ecoregions, potential natural vegetation (i.e. vegetation types that would of occurred were it not for the major man-made transformations) was added as an additional criterion (Kleynhans *et al.* 1998a, b). The assumption in an ecoregion approach is that instream features such as the distribution of the biota or water chemistry are intimately linked to these variables (Eekhout *et al.* 1997).

Map overlays of the various variables were prepared and used to qualitatively determine ecoregions (Kleynhans *et al.* 1998a). This process was iterative until the resulting delineations could not be improved upon based on the available information. The variables considered in ecoregion classification are given in Table 1. It is envisaged that the ecoregion boundaries may change as our knowledge of the region improves.

Using the variables and sources of information in Table 1, the following descriptions have been given for each ecoregion which occurs within the study region (taken from Kleynhans *et al.* 1998a, Figure 2).

Ecoregion 1: Limpopo Plain

- This ecoregion is characterized by plains and lowlands with a low to moderate relief, while the vegetation consists mostly of Bushveld types and Mopane veld.
- Mean Annual Precipitation (MAP) varies from 200 600 mm. Mean annual temperatures vary from 18 - 22 °C.

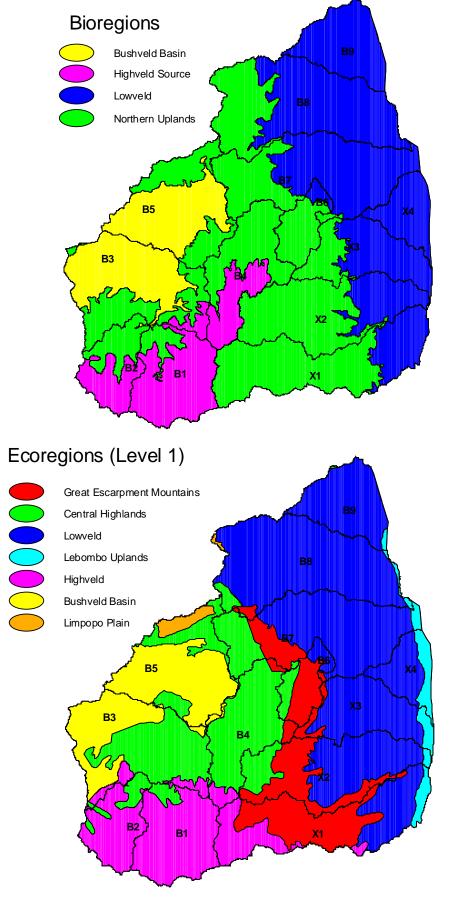


Figure 2. DWAF secondary drainage regions B1-B9 and X1-X4 in relation to two regional classifications, namely Bioregions (Brown *et al.* 1996) and Ecoregions (Level 1)

- Median annual simulated runoff per quaternary catchment varies from < 5 mm to 40 60 mm. The
 coefficient of variation (CV) for annual simulated runoff per quaternary catchment varies from 80 %
 to > 160 %.
- Altitude mostly ranges between 400 1000 m a.m.s.l. but with some parts in the east being 200 400 m a.m.s.l.
- Rock types include sandstone, sand, mudstone and basalt.
- Soil texture types include sand-loam, sand-clay and sand-clay-loam.

Table 1. Variables and sources of information considered in the ecoregion classification (from Kleynhans *et al.* 1998a).

Variable	Sources
Physiography	King (1942), Reader's Digest (1984), Brown <i>et al.</i> (1996), van Riet <i>et al.</i> (1997), and US Geological Survey Relief Shading Images (1998).
Climate	Midgley et al. (1994), Schulze et al. (1997).
Geology and soils	Anhaeusser and Maske (1986), Lurie (1994), Midgley <i>et al.</i> (1994), Schulze <i>et al.</i> (1997), van Riet <i>et al.</i> (1997).
Potential natural vegetation	Primarily the classification of Low and Rebelo (1996) was used. For broader reference purposes van Riet <i>et al.</i> (1997) and the vegetation biomes of Rutherford and Westfall (1994) was also used.

Ecoregion 2: Central Highlands

- Open hills, low mountains and table lands with high to moderate to low relief constitute the
 physiography. Lowlands with a high relief are present while plains with a moderate relief are rare.
 Only one area with high mountains occurs (Blouberg). Vegetation includes mainly bushveld
 (mountain and mixed) types. Isolated patches of indigenous forest occur (i.e. Blouberg and
 Soutpansberg).
- Median annual simulated runoff per quaternary catchment varies from 40 150 mm with some catchments in the east having a runoff of > 250 mm. The CV for annual simulated runoff varies from 40 % to 100 %.
- MAP varies from 400 800 mm, while mean annual temperature varies from 14 20 °C.
- Altitude varies from 800 1750 m a.m.s.l.
- Rock types include sandstone, quartzite, hornblende and biotite granite, ironstone and basalt.
- Soil texture types include sand-loam, sand-clay, sand-clay-loam, clay and sand.

Ecoregion 3: Bushveld Basin

- This region consists predominantly of plains with a low relief. In the east plains with a moderate relief and lowlands with a low relief occur. Vegetation types consist of thorn and mixed bushveld types.
- Median annual simulated runoff per quaternary catchment varies from 20 80 mm. The CV for annual simulated runoff per quaternary catchment varies from 60 140 %.
- MAP varies from 400 800 mm, while mean annual temperature varies from 14 20 °C.
- Altitude varies from 600 1 500 m a.m.s.l.
- Rock types include quartzite, hornblende and biotite granite, mudstone and basalt.
- Soil texture types include clay, sand-loam and sand-clay-loam.

Ecoregion 4: Great Escarpment Mountains

- This region is not continuous and extends along the Great Escarpment of South Africa. High and low mountains with high relief are common. Vegetation consists mostly of mountain grassland types with patches of isolated afromontane forest in some parts.
- Median annual simulated runoff per quaternary catchment varies from 10 to > 250 mm. The CV for annual simulated runoff per quaternary catchment varies from < 40 - 120 %.
- MAP varies from 400 to > 1200 mm, while mean annual temperature varies from < 8 20 °C.
- Altitude varies from 800 -> 2500 m a.m.s.l.
- The rock types include quartzite, quartzitic sandstone, sandstone and mudstone,
- Soil texture types include sand-clay-loam, sand-loam and sand-clay.

Ecoregion 5: Lowveld

- Plains with a low to moderate relief are common in this region but open hills with high relief and low mountains with high relief are also present (mostly towards the west). Lowveld bushveld types are the most common vegetation, but in the north mopane bushveld and shrubland occur.
- Median annual simulated runoff per quaternary catchment varies from 40 150 mm. The CV for annual simulated runoff per quaternary catchment varies from 60 120 %.
- MAP varies from 400 800 mm, while mean annual temperature varies from 20 to > 22 °C.
- Altitude varies from 200 800 m a.m.s.l.
- Rock types include ironstone, sandstone, mudstone and basalt.
- Soil texture types include sand-clay-loam, sand-clay, loamy-sand and sand-loam.

Ecoregion 6: Lebombo Uplands

- Closed hills with moderate relief and low mountains with a high relief are characteristic of this region, while arid mountain bushveld is the dominant vegetation type.
- Median annual simulated runoff per quaternary catchment varies from 20 150 mm. The CV of annual simulated runoff per quaternary catchment varies from 60 - 140 %.

- MAP varies from 400 800 mm, while mean annual temperature varies from 20 to > 22 °C.
- Altitude varies from 100 400 m a.m.s.l.
- Rock types include mudstone and basalt.
- Soil texture types include sand-clay-loam, sand-clay and loam-sand.

Ecoregion 7: Highveld

- Plains generally characterize this region with low and moderate relief but also significant areas of lowlands with low and high relief, open hills with low relief and closed hills with moderate relief.
 Vegetation consists of a combination of grassland types with moist types present towards the east and drier types towards the west and south.
- Median annual simulated runoff per quaternary catchment varies from 10 250 mm. The CV for annual simulated runoff per quaternary catchment varies from 40 160 %.
- MAP varies from 400 1200 mm, while mean annual temperature varies from 14 to 18 °C.
- Altitude varies from 1250 1750 m a.m.s.l.
- Rock types include sandstone, quartzite, mudstone, basalt and biotite granite.

The level 1 and 2 ecoregions which occur within Mpumalanga province compared to those in DWAF drainage regions B and X are given in Table 1. The decimal digits refer to the Ecoregion Level 2 classifications (Figure 3).

Table 2. Ecoregion Level 1 and 2 regions showing differences between Mpumalanga Province and DWAF drainage regions B and X. The decimal digits refer to the Ecoregion Level 2 classification.

	Mpumalanga Province	Regions B and X
Ecoregion Level 1	Ecoregion Level 2	Ecoregion Level 2
1. Limpopo Plain		1.03, 1.04
2. Central Highlands	2.08, 2.09, 2.10, 2.11, 2.12	2.01, 2.08, 2.09, 2.10, 2.11, 2.12, 2.13, 2.14
3. Bushveld Basin	3.02, 3.03	3.02, 3.03
4. Great Escarpment Mountains	4.01, 4.02, 4.03, 4.04	4.01, 4.02, 4.03, 4.04
5. Lowveld	5.01, 5.02, 5.05, 5.06, 5.07	5.01, 5.02, 5.03, 5.04, 5.05, 5.06, 5.07
6. Lebombo Uplands	6.01, 6.02	6.01, 6.02
7. Highveld	7.01, 7.02, 7.03, 7.04, 7.05	7.01, 7.02, 7.03, 7.04, 7.05

Level 2 ecoregions were derived in a similar manner as to level 1 ecoregions but an attempt was made to consider more detailed information in the determination of the level 2 ecoregion boundaries (Kleynhans *et al.* 1998b). This level does not form a part of the three tier spatial hierarchical framework described in this report, but rather, may contribute to the level 3 river type groupings.

DWAF secondary drainage regions B and X are presented in relation to ecoregion level 2 (Figure 3, Kleynhans *et al.* 1998b), broad terrain patterns (Figure 4, Van Riet *et al.* 1997), broad terrain morphological divisions (Figure 5, Van Riet *et al.* 1997), terrain morphology (Figure 6, Van Riet *et al.* 1997), natural potential vegetation (Figure 7, Low and Rebelo 1996) and lithostratigraphic units (Figure 8, Vegter 1995). The terrain morphology is hierarchical with broad terrain patterns depicting the upper level of the hierarchy, broad terrain morphological divisions depicting the middle level and terrain morphology the lowest or most detailed level of the morphological classification.

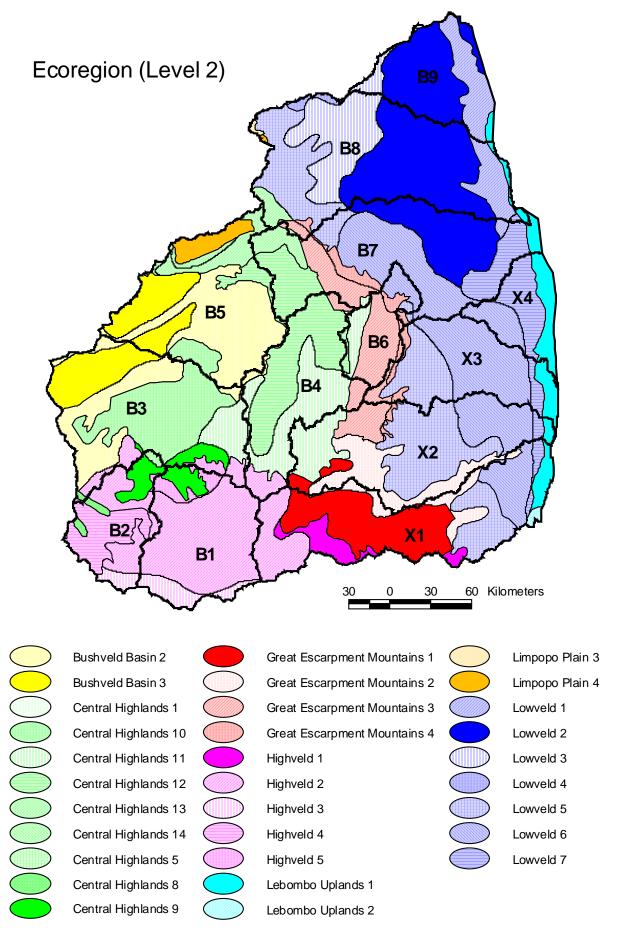


Figure 3. DWAF secondary drainage regions B1-B9 and X1-X4 in relation to Ecoregion Level 2s.

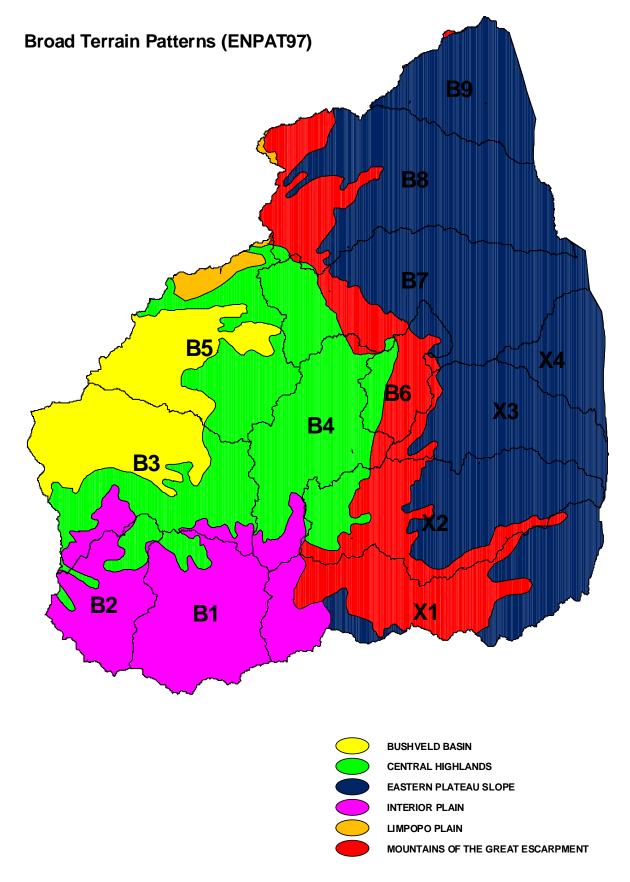


Figure 4. DWAF secondary drainage regions B1-B9 and X1-X4 in relation to broad terrain patterns (modified from van Riet *et al.* 1997)

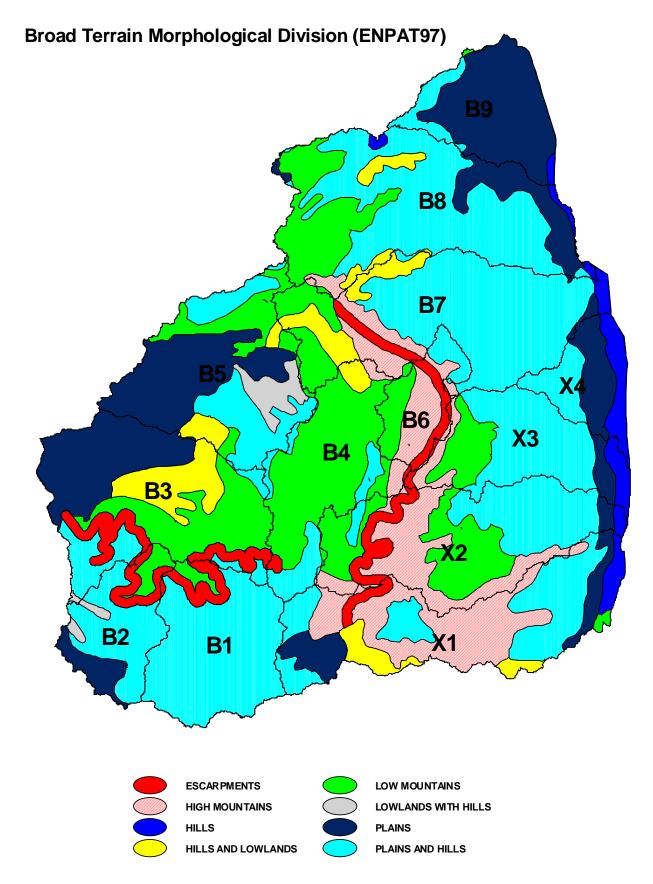


Figure 5. DWAF secondary drainage regions B1-B9 and X1-X4 in relation to broad terrain morphological divisions (modified from van Riet *et al.* 1997)

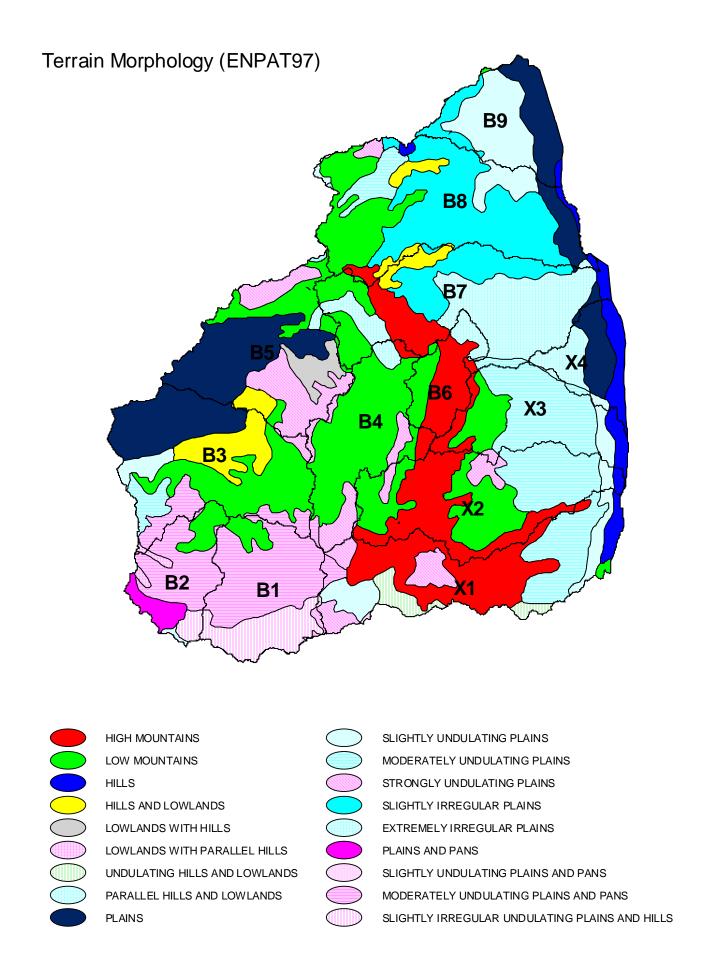


Figure 6. DWAF secondary drainage regions B1-B9 and X1-X4 in relation to terrain morphology (modified from van Riet *et al.* 1997)

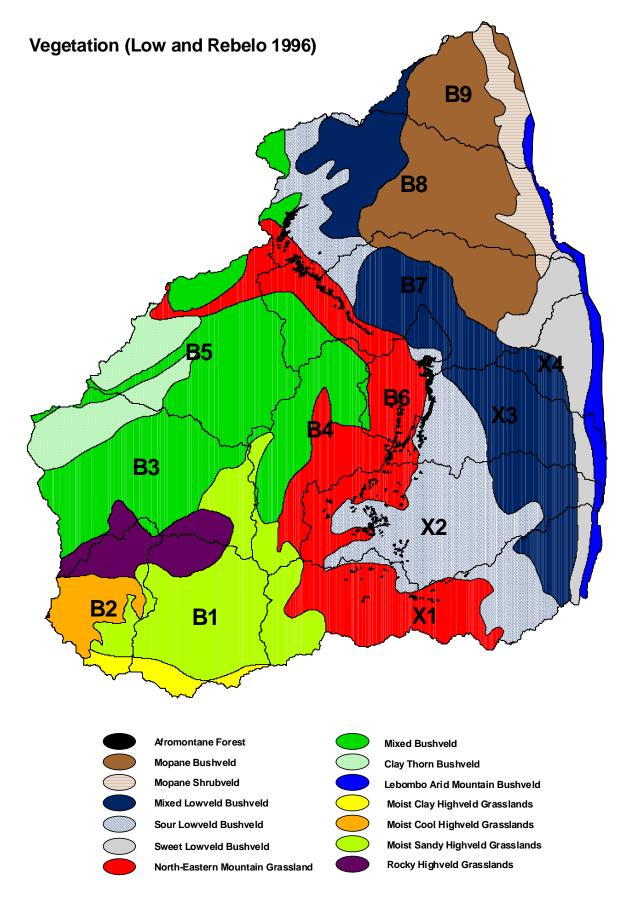


Figure 7. DWAF secondary drainage regions B1-B9 and X1-X4 in relation to potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

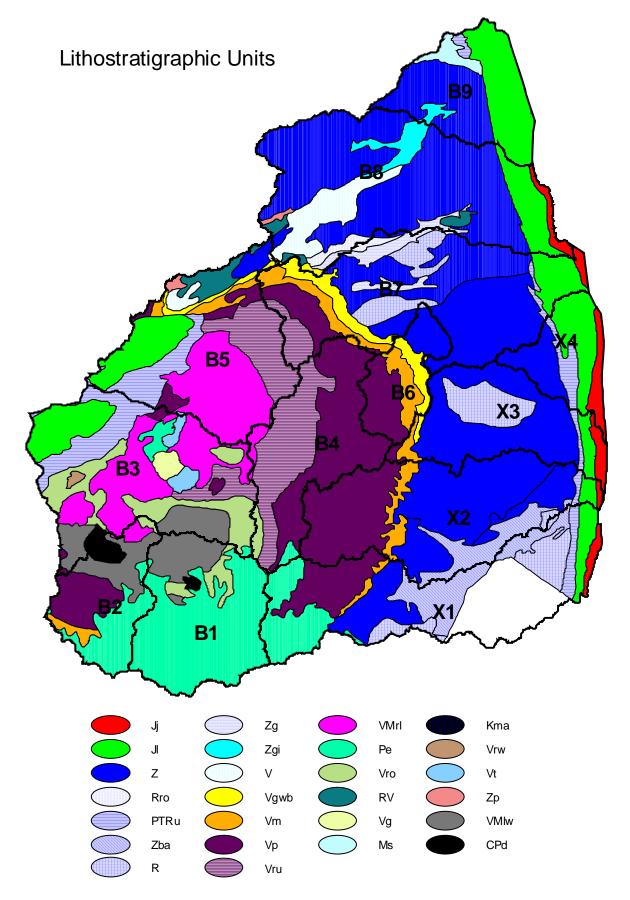


Figure 8. DWAF secondary drainage regions in relation to lithostratigraphic units (modified from Vegter 1995). Definitions and details of the lithostratigraphic units are given in Appendix 2.

2.3 Level 2. Geomorphological zones or subregions

A sub-regional classification, which reflects broad geomorphological characteristics and distribution patterns of components of the biota, was developed at the spatial framework workshop (Brown *et al.* 1996). The main rivers and selected tributaries of regions B and X were divided into sub-regions, such as Source Zone, High Gradient Mountain Stream, Mountain Stream, Foothill-cobble bed, Foothill-gravel bed (previously termed Transitional) and Lowland Floodplain based on the proposed geomorphological divisions of Rowntree and Wadeson (1999, Table 3). Three other geomorphological zones, namely Upland Flood Plain, Rejuvenated Cascade (or gorge) and Rejuvenated Foothill were also identified, where possible, based on examination of channel gradient in relation to surrounding topography on cartographic maps. In some cases, however, zonation will only be verified at the ground-truthing stage.

The primary determinant of these geomorphological zones is channel gradient (see report on geomorphological zonation, Rowntree and Du Plessis 1998), where particular ranges in gradient characterise each geomorphological zone. These ranges are based on commonly found associations and may be modified in the light of further experience (K. Rowntree, Rhodes University, pers. comm). Details of the methodological aspects related to this component of the research are available in Rowntree and Du Plessis (1998). The assumption is that these geomorphological zones reflect distribution patterns of components of the biota and a project, currently underway in the Freshwater Research Unit, University of Cape Town, aims to establish the link between these geomorphological zones and observed biotic zonation J. King, Freshwater Research Unit, University of Cape Town, pers. Comm.).

Rivers in DWAF secondary catchments B1 to B7, X2 and X3 were digitised from 1:250 000 maps and the main rivers and tributaries divided into geomorphological zones. Details of the rivers coverage is given below and in Figure 9.

- B1: Olifants, Klein Olifants, Steenkoolspruit
- B2: Bronkhorstspruit, Wilge
- B3: Olifants, Elands, Moses, Selons
- B4: Dorps, Spekboom, Steelpoort
- B5: Olifants, Chunies, Ngwaritsi
- B6: Blyde, Ohrigstad
- B7: Olifants, Ga-Selati, Klaserie, Timbavati
- X2: Crocodile, Elands, Kaap (Noord-Kaap), Mbyamiti, Nelspruit, Nsikasi
- X3: Sabie, Marite, Sand

Table 3. Geomorphological zonation of river channels (after Rowntree *et al.* 1996, Rowntree and Wadeson 1999, and Rowntree *et al.* 1998, with acknowledgement to Harrison and Elsworth 1958, Olif 1960 and Chutter 1967)

Geomorphological Zone	Characteristic Gradient	Diagnostic Channel Characteristics
A. Zonation associat	ted with a 'normal	l' profile
Source zone	not specified	Low gradient, upland plateau or upland basin able to store water. Spongy or peaty hydromorphic soils.
Mountain Headwater Stream	0.1 - 0.7	A very steep gradient stream dominated by vertical flow over bedrock with waterfalls and plunge pools. Normally first or second order. Reach types include bedrock fall and cascades.
Mountain Stream	0.01 - 0.1	Steep gradient stream dominated by bedrock and boulders, locally cobble or coarse gravels in pools. Reach types include cascades, bedrock fall, steppool, plane bed, pool-rapid or pool riffle. Approximate equal distribution of 'vertical' and 'horizontal' flow components.
Foothills (cobble bed)	0.005 - 0.01	Moderately steep, cobble-bed or mixed bedrock-cobble bed channel, with plane bed, pool-riffle or pool-rapid reach types. Length of pools and riffles/rapids similar. Narrow floodplain of sand, gravel or cobble often present.
Foothills (gravel bed)	0.001 - 0.005	Lower gradient mixed bed alluvial channel with sand and gravel dominating the bed, locally may be bedrock controlled. Reach types typically include pool- riffle or pool-rapid, sand bars common in pools. Pools of significantly greater extent than rapids or riffles. Floodplain often present.
Lowland Floodplain or Lowland sand bed	0.0001- 0.001	Low gradient alluvial sand bed channel, typically regime reach type. Often confined, but fully developed meandering pattern within a distinct floodplain develops in unconfined reaches where there is an increased silt content in bed or banks.
B. Additional zones	associated with a r	rejuvenated profile
Rejuvenated Bedrock fall / Cascades	0.01 - 0.5	Moderate to steep gradient, often confined channel (gorge) resulting from uplift in the middle to lower reaches of the long profile, limited lateral development of alluvial features, reach types include bedrock fall, cascades and pool-rapid.
Rejuvenated Foothills	0.001 - 0.01	Steepened section within middle reaches of the river caused by uplift, often within or downstream of gorge; characteristics similar to foothills (gravel/cobble bed rivers with pool-riffle/ pool-rapid morphology) but of a higher order. A compound channel is often present with an active channel contained within a macro channel activated only during infrequent flood events. A floodplain may be present between the active and macro-channel.
Upland Flood Plain	0.0001- 0.001	An upland low gradient channel, often associated with uplifted plateau areas as occur beneath the eastern escarpment.

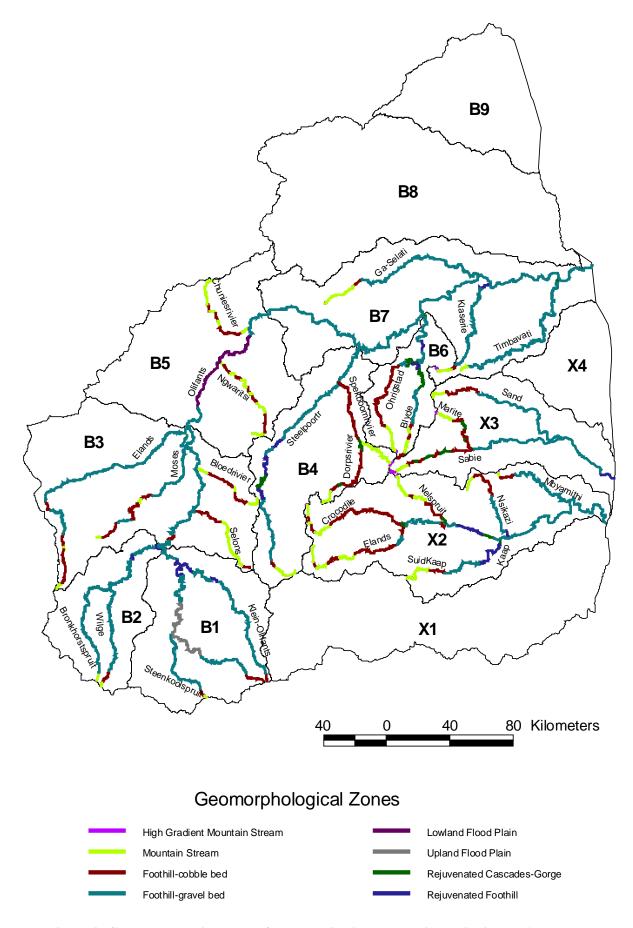


Figure 9. Geomorphological zones for the main rivers and tributaries in DWAF secondary catchments B and X.

The length of each geomorphological zone occurring in each Ecoregion Level 1 was expanded to give an indication of the proportion of each zone within each ecoregion (Figure 10). Given that only the main rivers and tributaries were divided into zones, this information only serves as a preliminary guide as to the proportional representation of each zone. Only the six most common ecoregions have been included in the analysis as the seventh, namely the Limpopo Plains, is only represented by a single river, and is therefore not likely to be reflective of general conditions within this ecoregion.

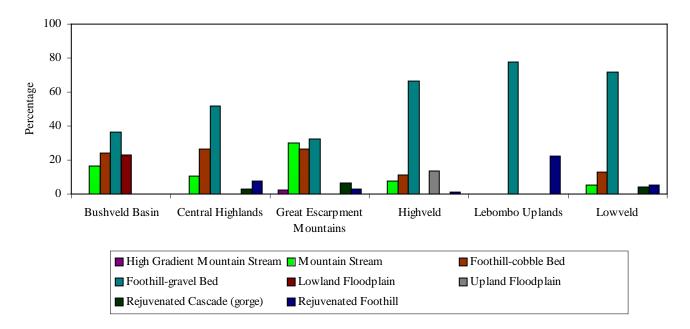


Figure 10. The proportional representation (as a percentage) of each geomorphological zone in the six common ecoregion in DWAF secondary catchments B and X.

Based on the zonation of the main rivers and tributaries in Figure 9, the Foothill-gravel Bed zone is the most common in all ecoregions, particularly so in the Highveld and Lowveld (Figure 10). The Lowland Floodplain zone is not represented in the Lowveld ecoregion. The Upland Floodplain zone occurs in the Highveld ecoregion. The Lebombo Uplands is only represented by the lower reaches of the Olifants, Crocodile and Sabie rivers and this analysis is therefore unlikely to be an accurate reflection of the relative importance of the two zones represented, namely the Rejuvenated Foothill and the Foothill-gravel bed zones. The Bushveld Basin has a relatively even spread of Mountain Stream, Foothill-cobble bed, Foothill-gravel bed and Lowland Floodplain zones, whilst in the Central Highlands, the Foothill-gravel bed zone is the most common, followed by Foothill-cobble bed. The Great Escarpment Mountain ecoregion has similar proportions of Mountain Stream, Foothill-cobble bed and Foothill-gravel bed zones.

The geomorphological zones within each of the main rivers and tributaries are presented, together with the rivers coverage, for each DWAF secondary catchment (Figures 11 to 75). Rivers in catchments B8, B9, X1 and X4 are given at 1:500 000 scale and no geomorphological zones were identified. Rivers in

catchments B1 to B7 and X2 and X3 are given at 1:250 000 scale and the geomorphological zones of the main river and tributaries are included.

A summary table of all named rivers at 1:250 000 scale for secondary catchments B1 to B7 and X2 and X3, and 1:500 000 scale for secondary catchments B8, B9, X1 and X4, has been compiled (Table 4). Details related to each river's "parent" river, ecoregion level 1, vegetation type, geological or lithostratigraphic type and hydrological type (based on maps) are presented.

2.4 Level 3: River type

Level 3 of the hierarchy aims to account for variation among rivers within a sub-region or geomorphological zone. Factors such as river size, hydrological type (ephemeral, seasonal or perennial), geomorphological characteristics (channel type, substratum composition) and other chemical and biological factors are considered. It was initially intended to utilise local knowledge of river scientists in the region to identify likely river types, and a questionnaire was circulated to this end. However, poor response from local experts and insufficient information from available literature, prevented the identification of river types.

Whilst it is possible to group rivers on the basis of hydrological type using maps, this information needs to be verified in the field. In addition, river size, geomorphological and biological characteristics can only be assessed in the field and it seems, therefore, that this level of the hierarchy is best undertaken during ground-truthing or verification fieldwork. Components incorporated in level 1 ecoregions and presented graphically in this report such as terrain morphology, potential natural vegetation, geology or lithostratigraphy may also prove useful contributors to the identification of river types. Finalised river typing will, however, need to be done later at the field verification stage.

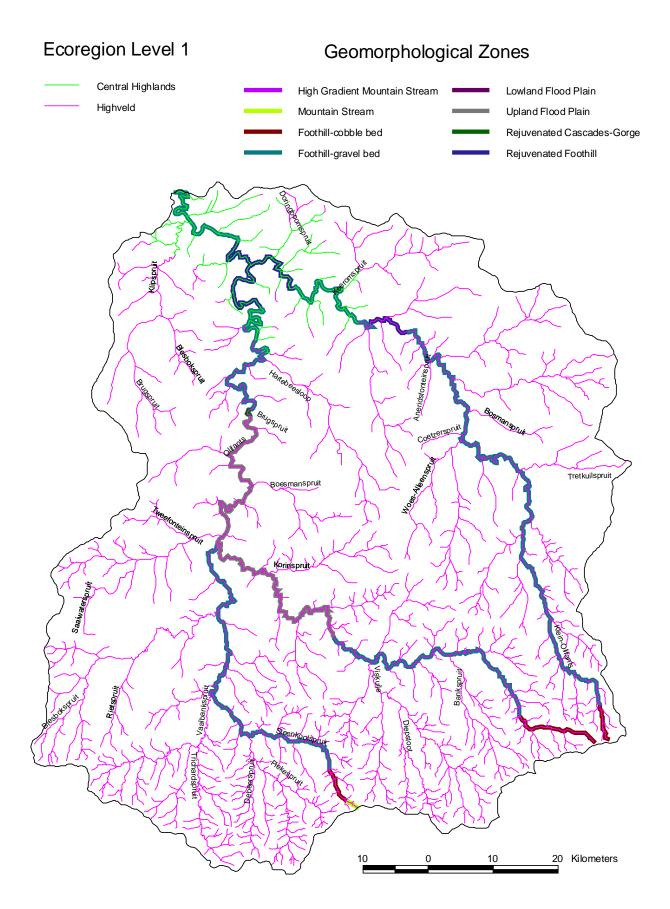


Figure 11. 1:250 000 rivers coverage for DWAF secondary catchment B1 coded by ecoregion level 1s and geomorphological zones.

Ecoregion Level 2 Central Highlands 9 Highveld 3 Highveld 2 Highveld 5 Tretkuilspruit

Figure~12.~1:250~000~rivers~coverage~for~DWAF~secondary~catchment~B1~showing~ecoregion~level~2s.

20 Kilometers

Terrain Morphology (ENPAT97)

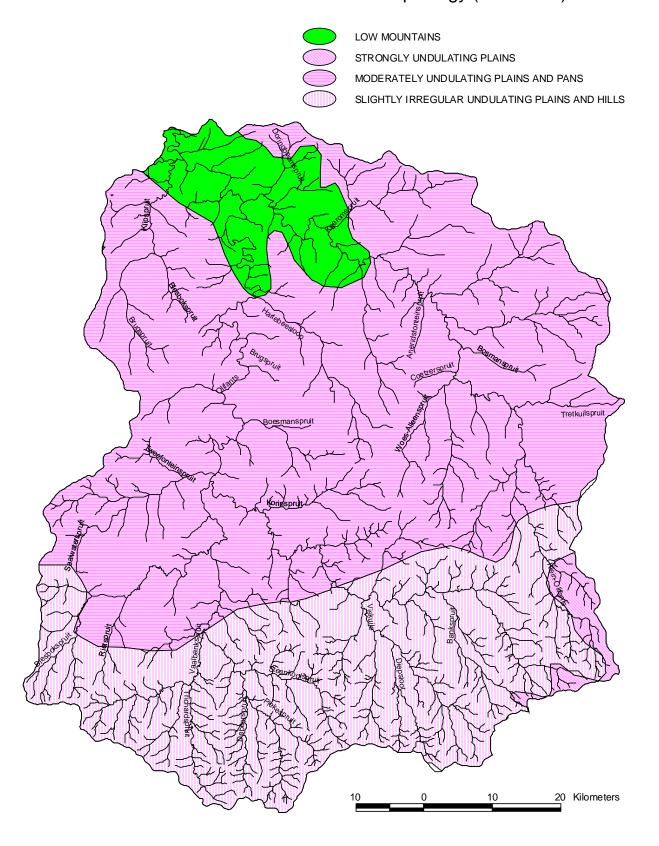
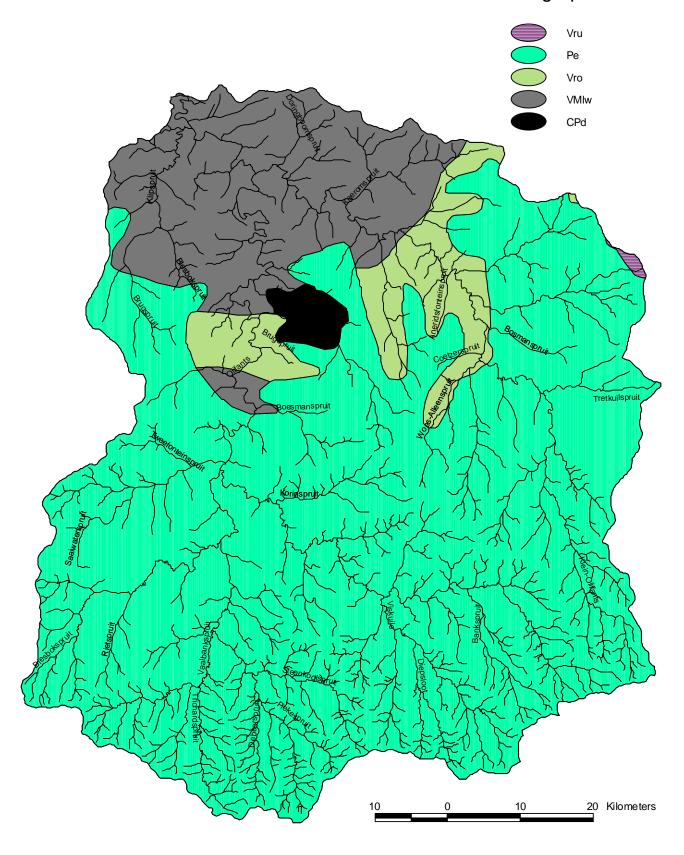


Figure 13. 1:250 000 rivers coverage for DWAF secondary catchment B1 showing terrain morphology (modified from Van Riet *et al.* 1997).

Vegetation (Low and Rebelo 1996) Moist Clay Highveld Grasslands Moist Sandy Highveld Grasslands Rocky Highveld Grasslands Tretkuilspruit 20 Kilometers

Figure 14. 1:250 000 rivers coverage for DWAF secondary catchment B1 showing potential natural vegetation (Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

Lithostratigraphic Units



Figure~15.~1:250~000~rivers~coverage~for~DWAF~secondary~catchment~B1~showing~lithostratigraphic~units~(modified~from~Vegter~1995).~Details~of~the~lithostratigraphic~units~are~given~in~Appendix~2.

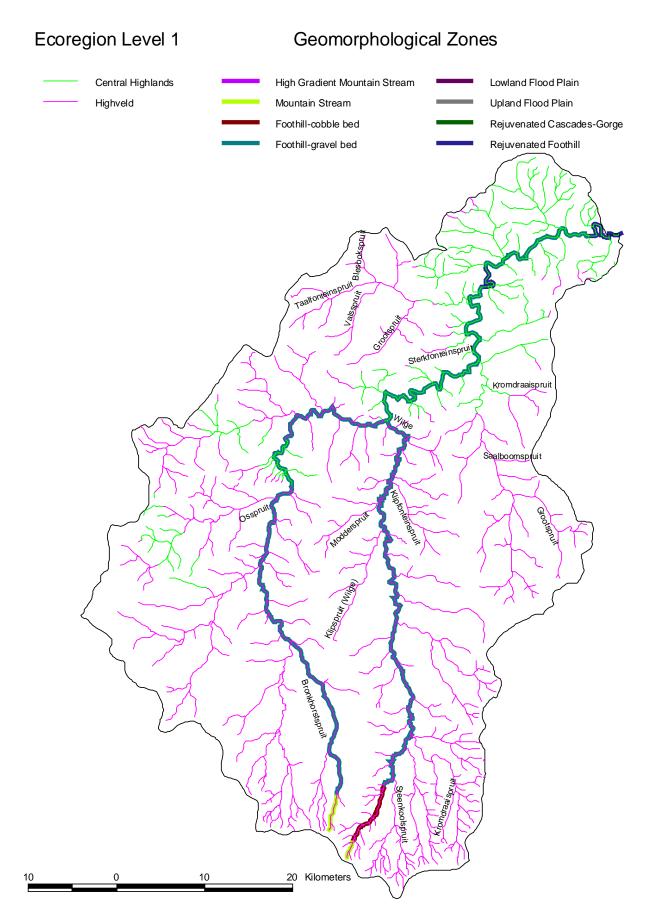


Figure 16. 1:250 000 rivers coverage for DWAF secondary catchment B2 coded by ecoregion level 1s and geomorphological zones.

Ecoregion Level 2

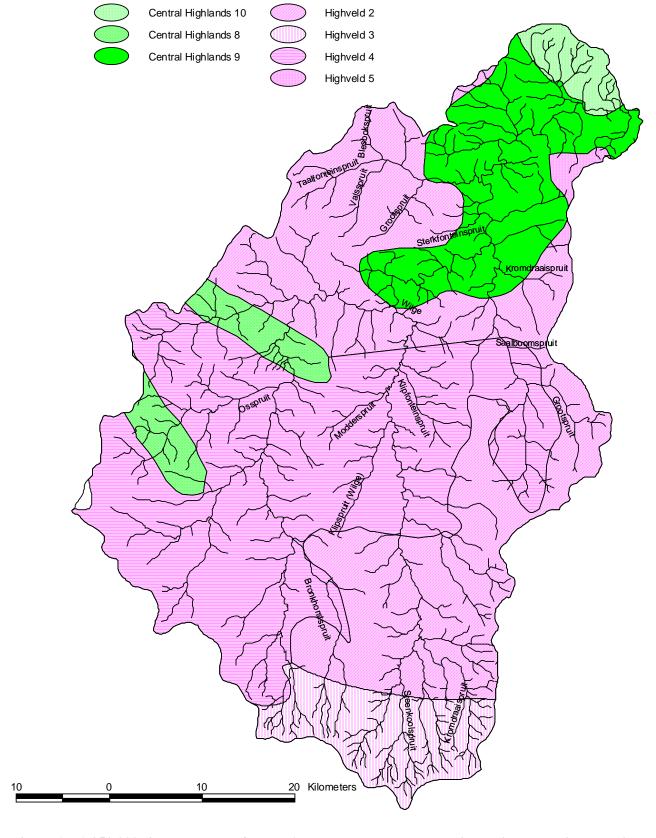


Figure 17. 1:250 000 rivers coverage for DWAF secondary catchment B2 showing ecoregion level 2s.

Terrain Morphology (ENPAT97)

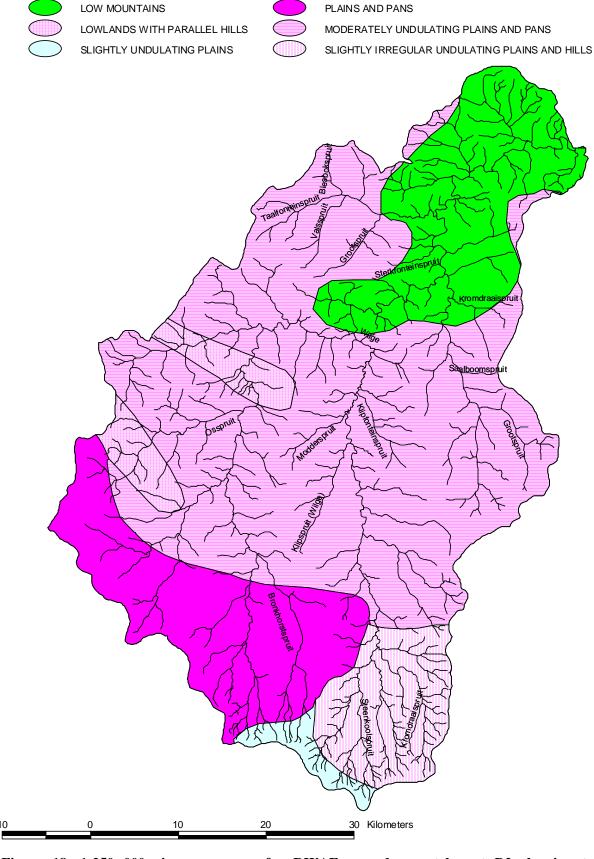


Figure 18. 1:250 000 rivers coverage for DWAF secondary catchment B2 showing terrain morphology (modified from Van Riet *et al.* 1997).

Vegetation (Low and Rebelo 1996)

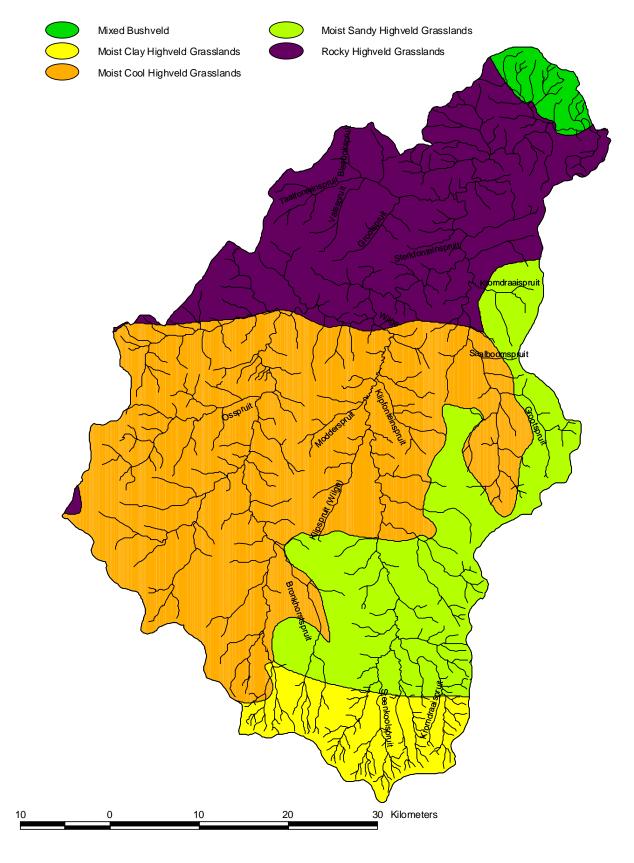


Figure 19. 1:250 000 rivers coverage for DWAF secondary catchment B2 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

Lithostratigraphic Units

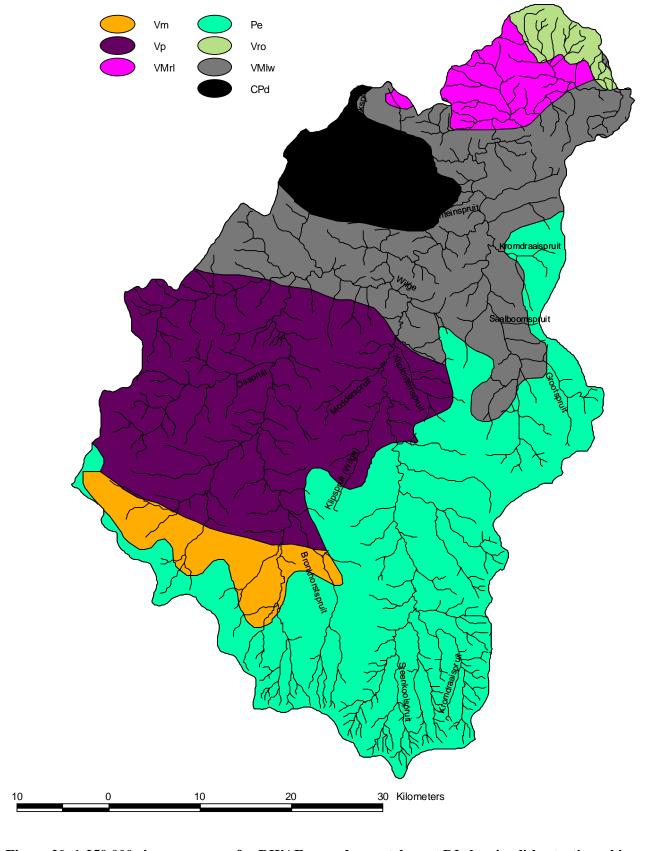


Figure 20. 1:250 000 rivers coverage for DWAF secondary catchment B2 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

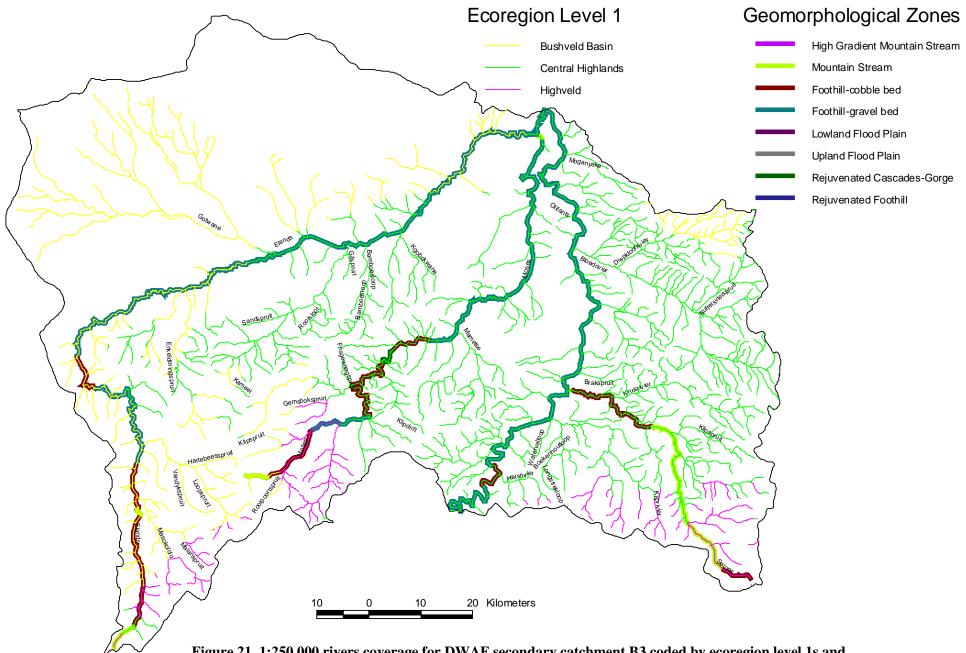
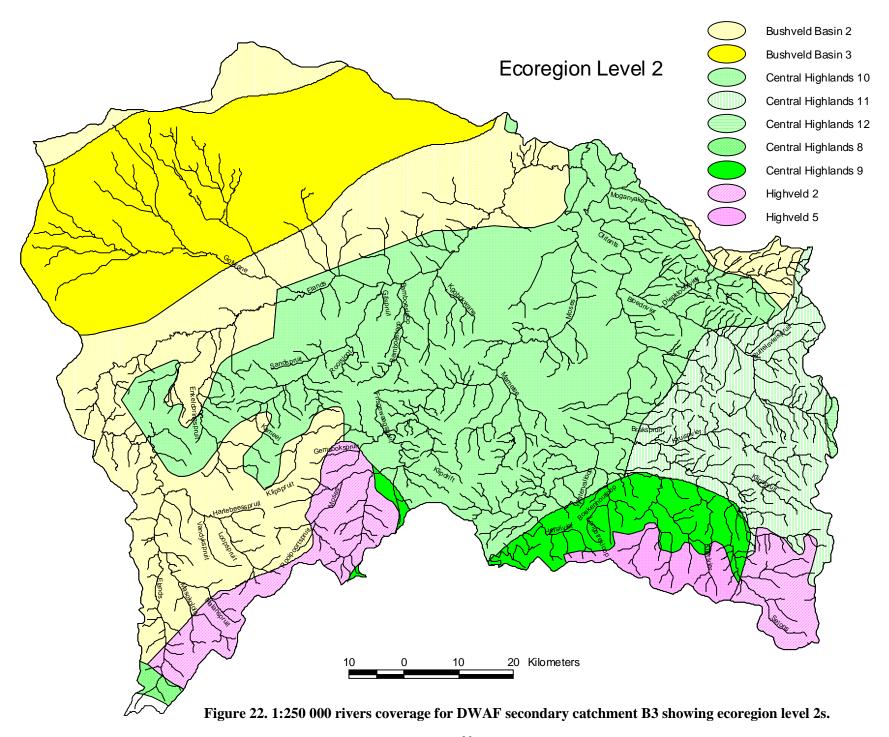
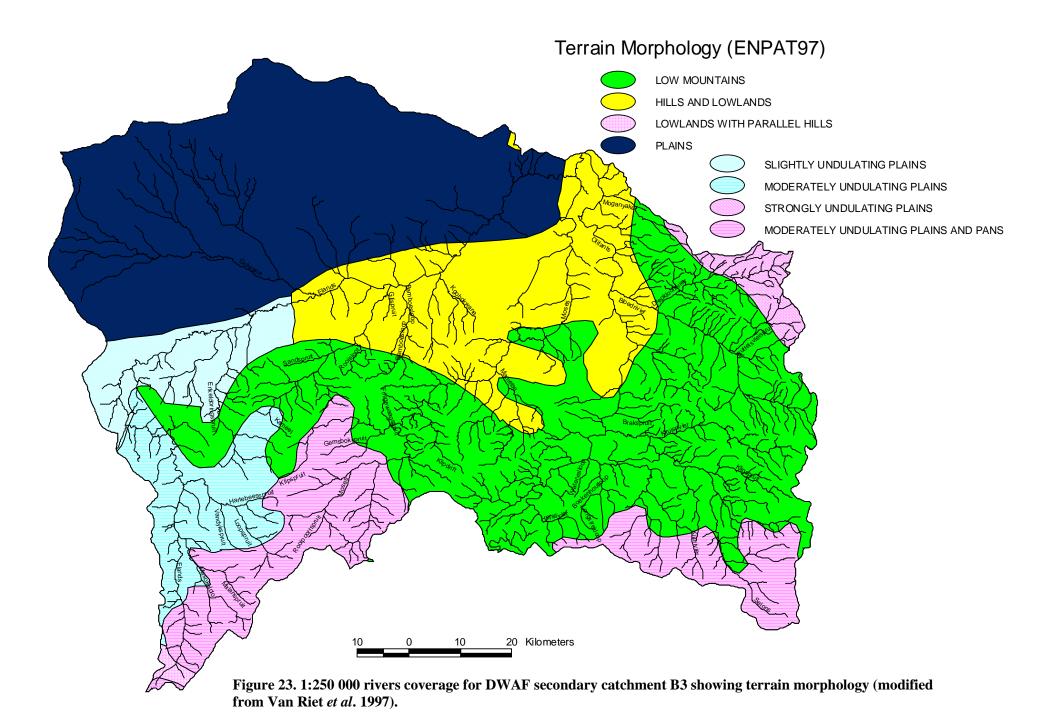


Figure 21. 1:250 000 rivers coverage for DWAF secondary catchment B3 coded by ecoregion level 1s and geomorphological zones.





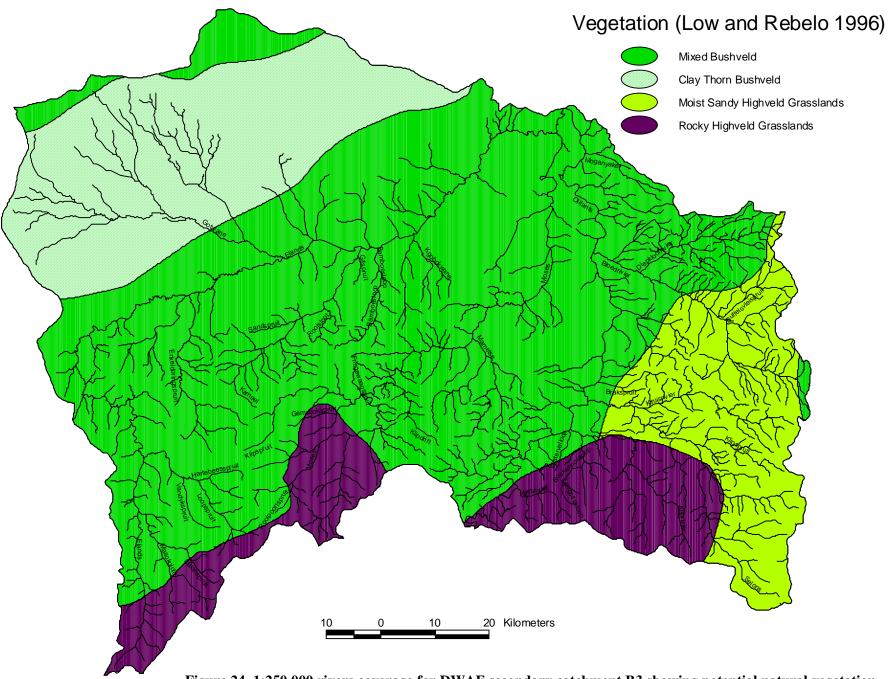


Figure 24. 1:250 000 rivers coverage for DWAF secondary catchment B3 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

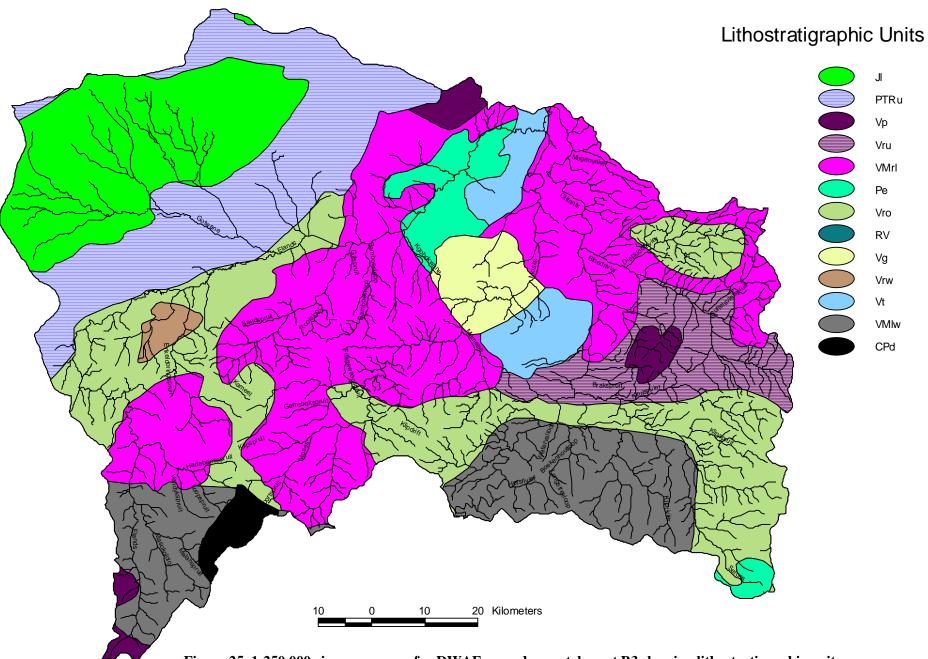


Figure 25. 1:250 000 rivers coverage for DWAF secondary catchment B3 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

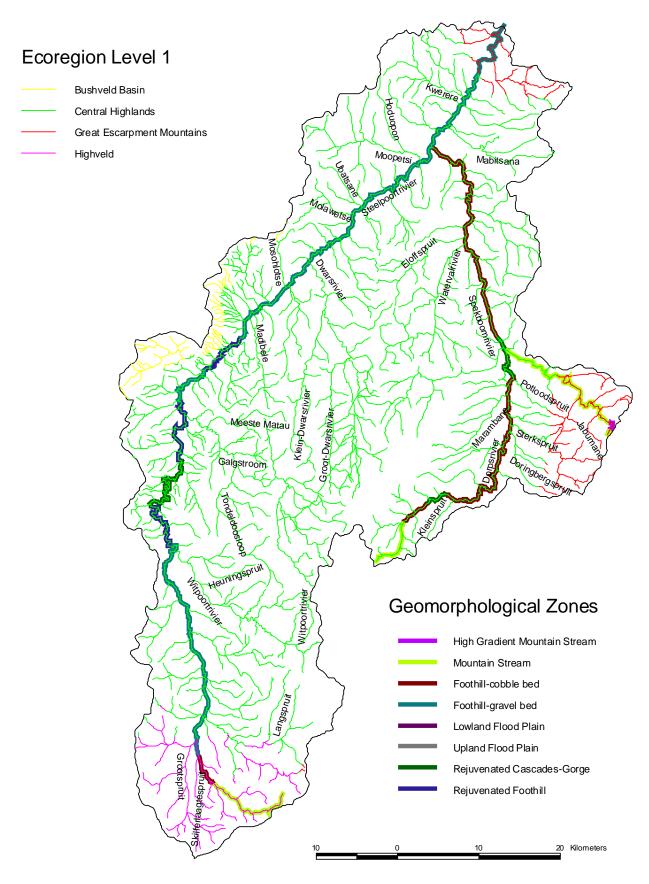


Figure 26. 1:250 000 rivers coverage for DWAF secondary catchment B4 coded by ecoregion level 1s and geomorphological zones.

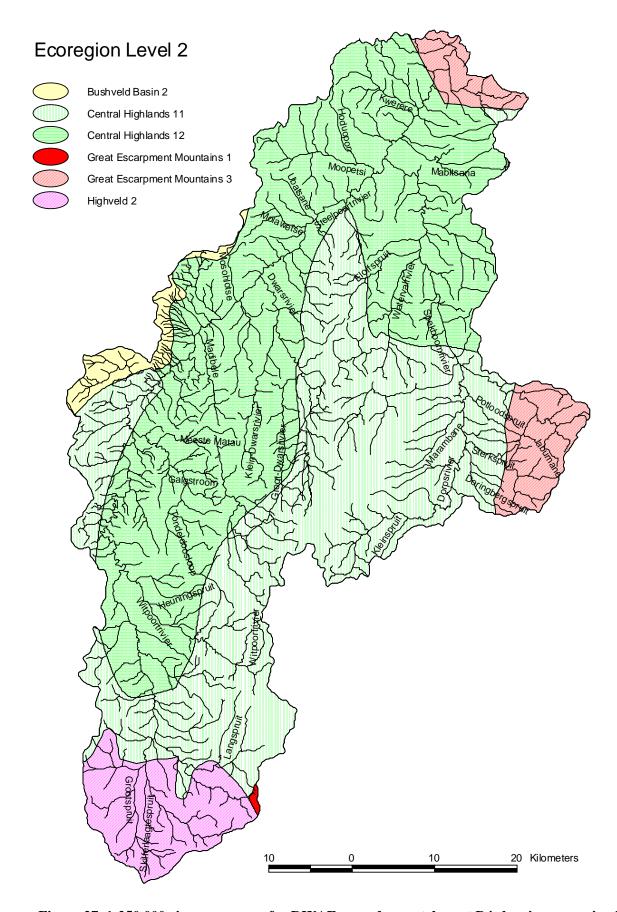


Figure 27. 1:250 000 rivers coverage for DWAF secondary catchment B4 showing ecoregion level 2s.

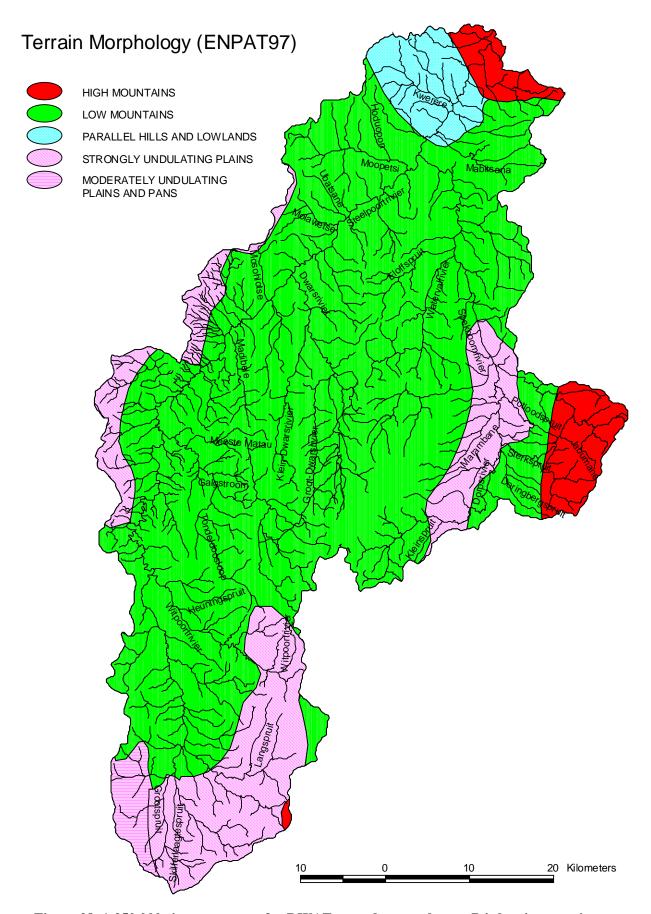


Figure 28. 1:250 000 rivers coverage for DWAF secondary catchment B4 showing terrain morphology (modified from Van Riet *et al.* 1997).

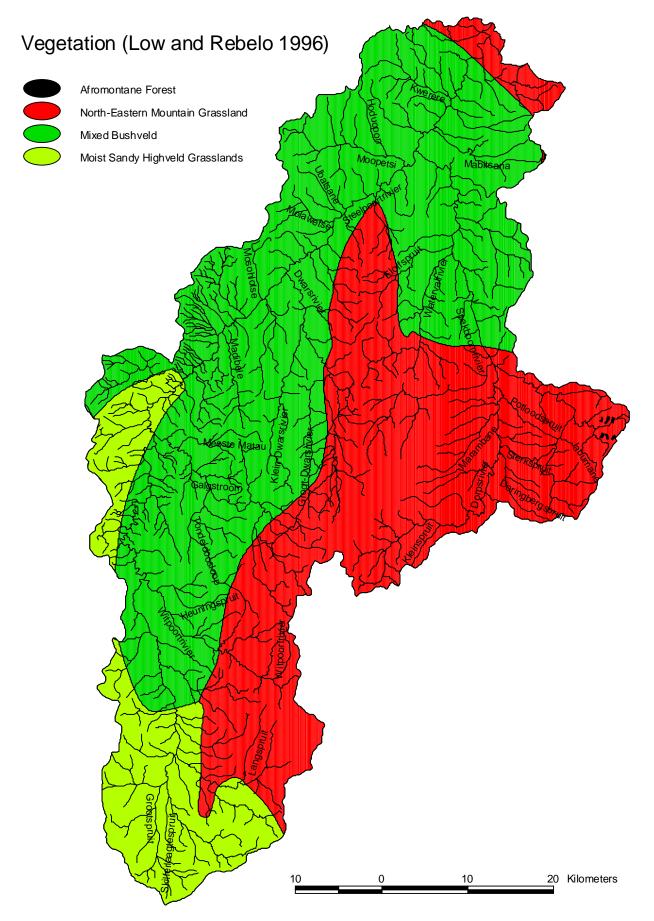


Figure 29. 1:250 000 rivers coverage for DWAF secondary catchment B4 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

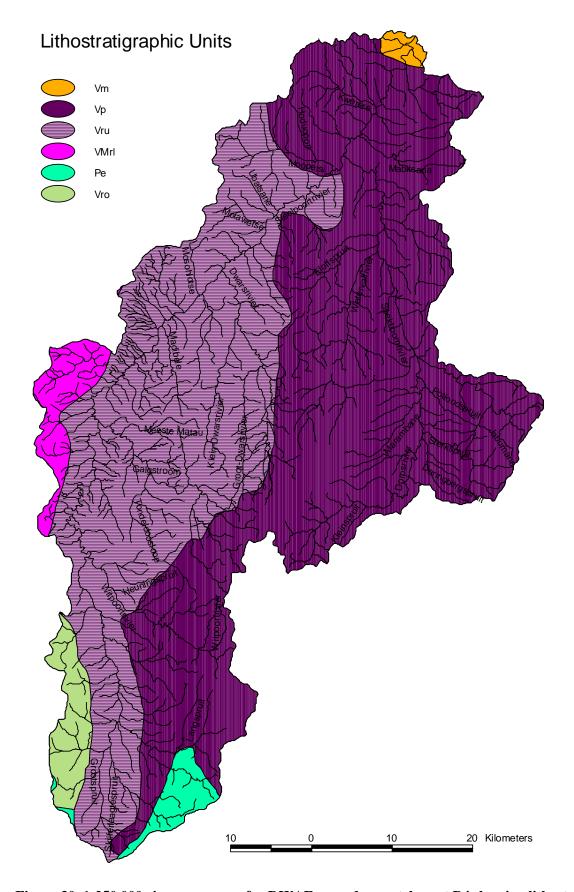


Figure 30. 1:250 000 rivers coverage for DWAF secondary catchment B4 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

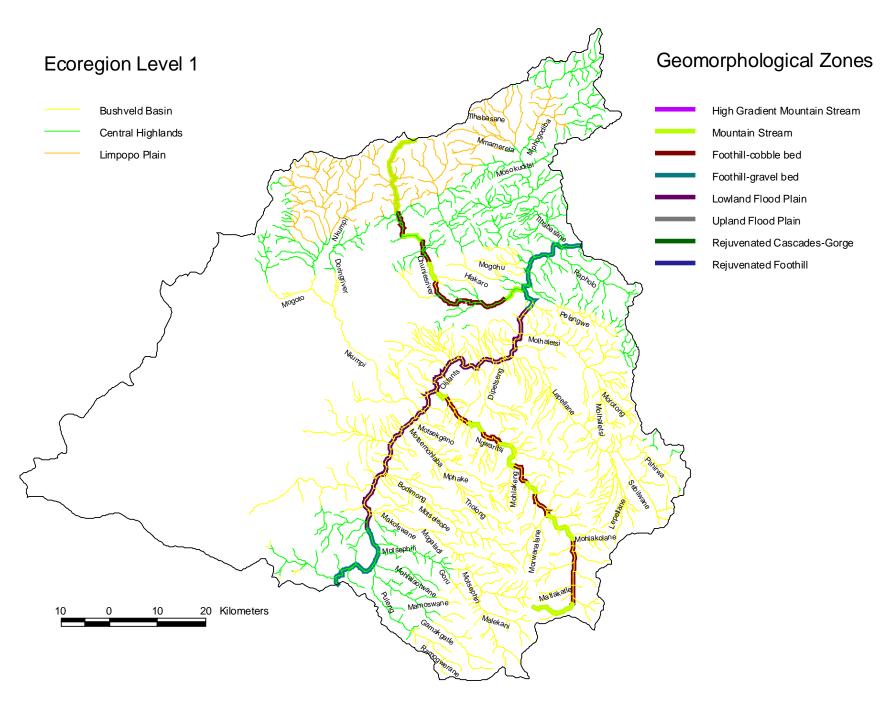


Figure 31. 1:250 000 rivers coverage for DWAF secondary catchment B5 coded by ecoregion level 1s and geomorphological zones.

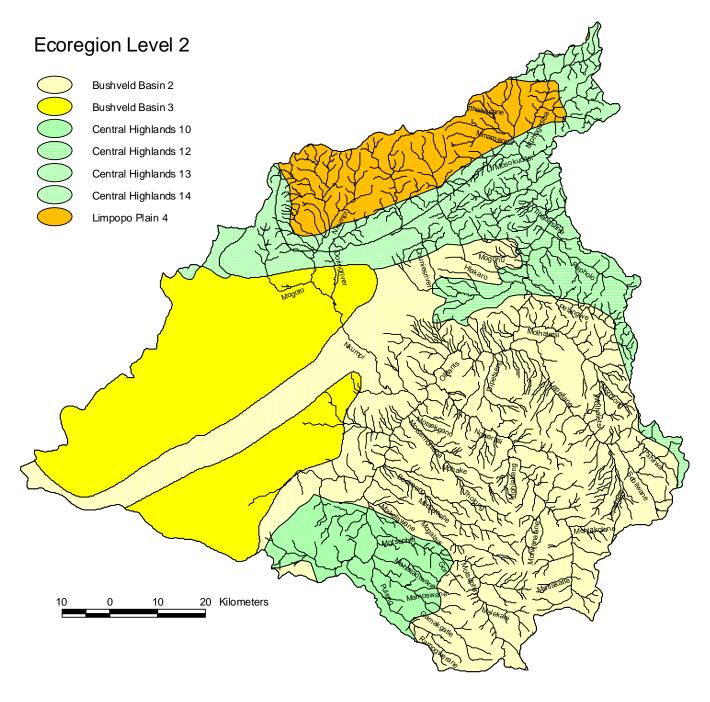


Figure 32. 1:250 000 rivers coverage for DWAF secondary catchment B5 showing ecoregion level 2s.

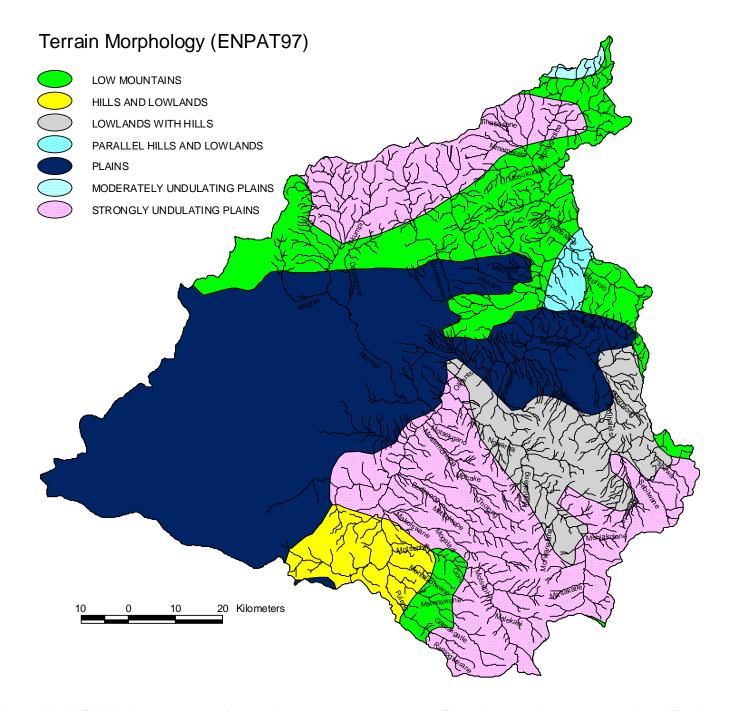


Figure 33. 1:250 000 rivers coverage for DWAF secondary catchment B5 showing terrain morphology (modified from Van Riet et al. 1997).

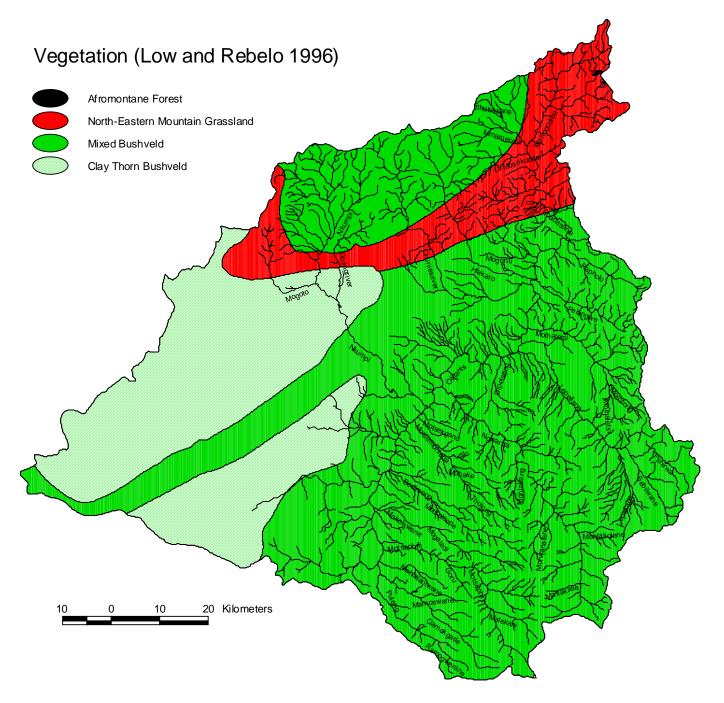


Figure 34. 1:250 000 rivers coverage for DWAF secondary catchment B5 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

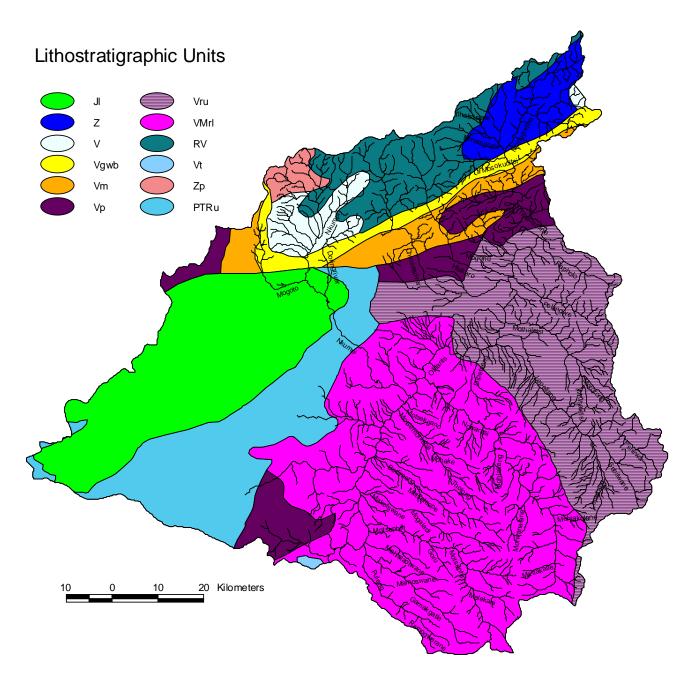


Figure 35. 1:250 000 rivers coverage for DWAF secondary catchment B5 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

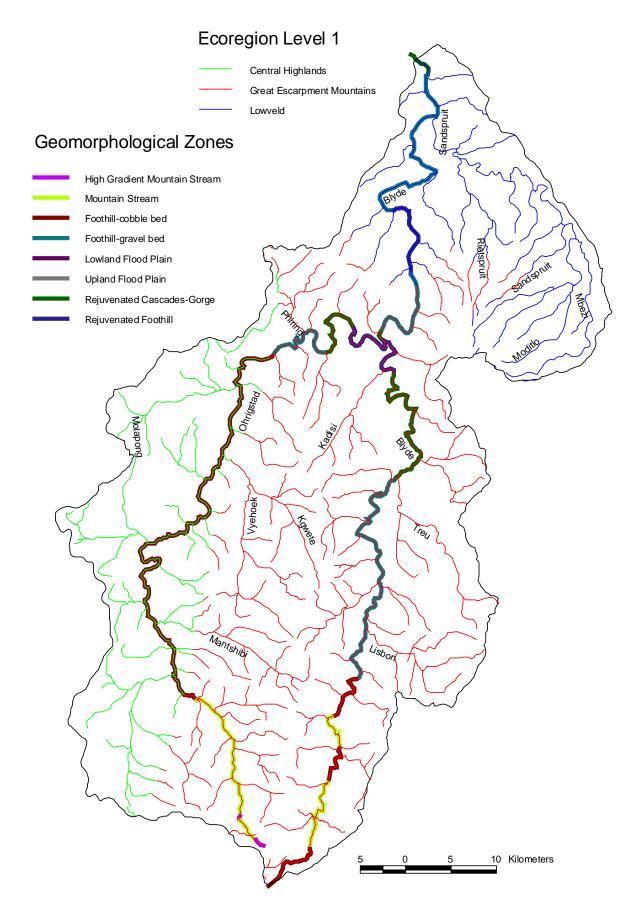


Figure 36. 1:250 000 rivers coverage for DWAF secondary catchment B6 coded by ecoregion level 1s and geomorphological zones.

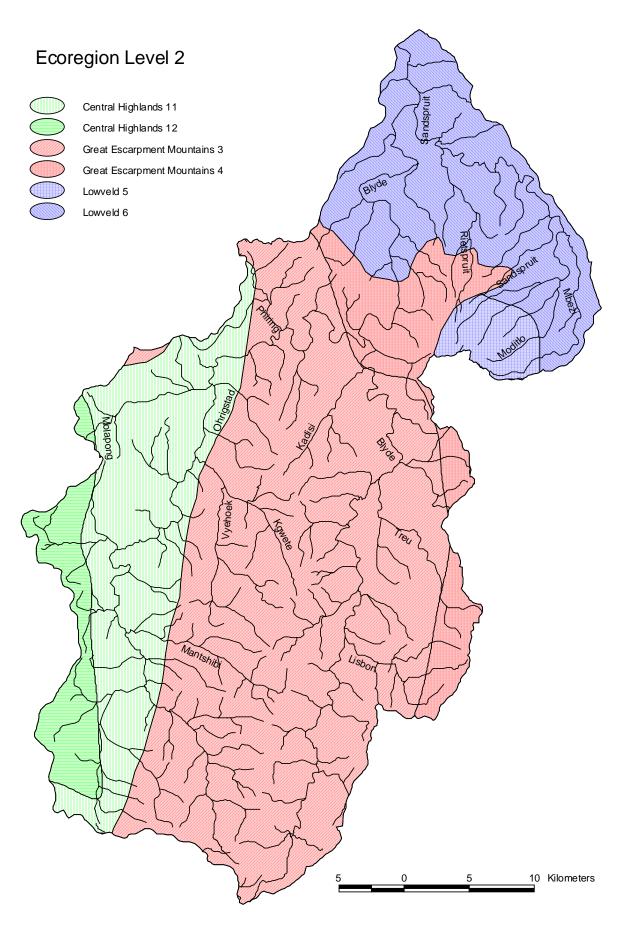


Figure 37. 1:250 000 rivers coverage for DWAF secondary catchment B6 showing ecoregion level 2s.

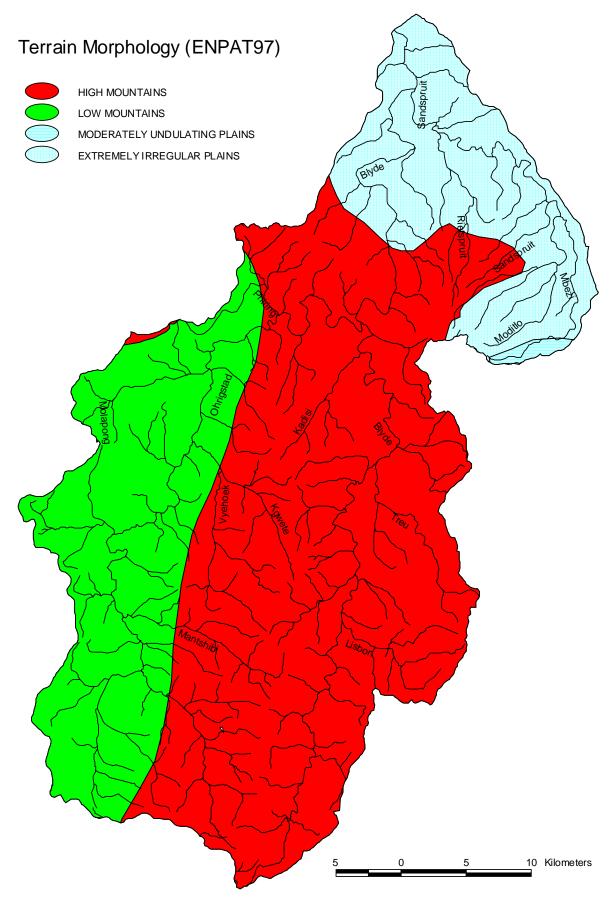


Figure 38. 1:250 000 rivers coverage for DWAF secondary catchment B6 showing terrain morphology (modified from Van Riet *et al.* 1997).

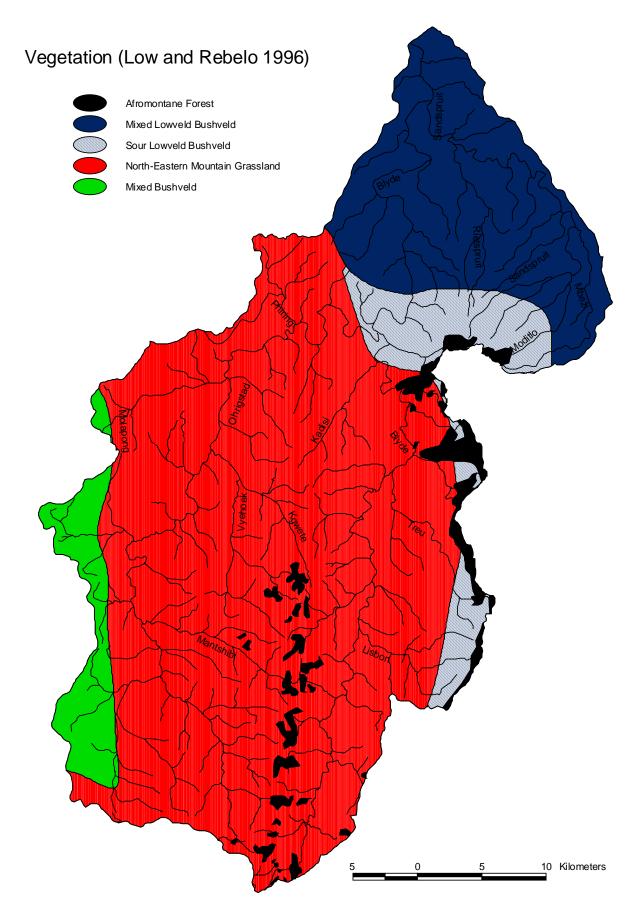


Figure 39. 1:250 000 rivers coverage for DWAF secondary catchment B6 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

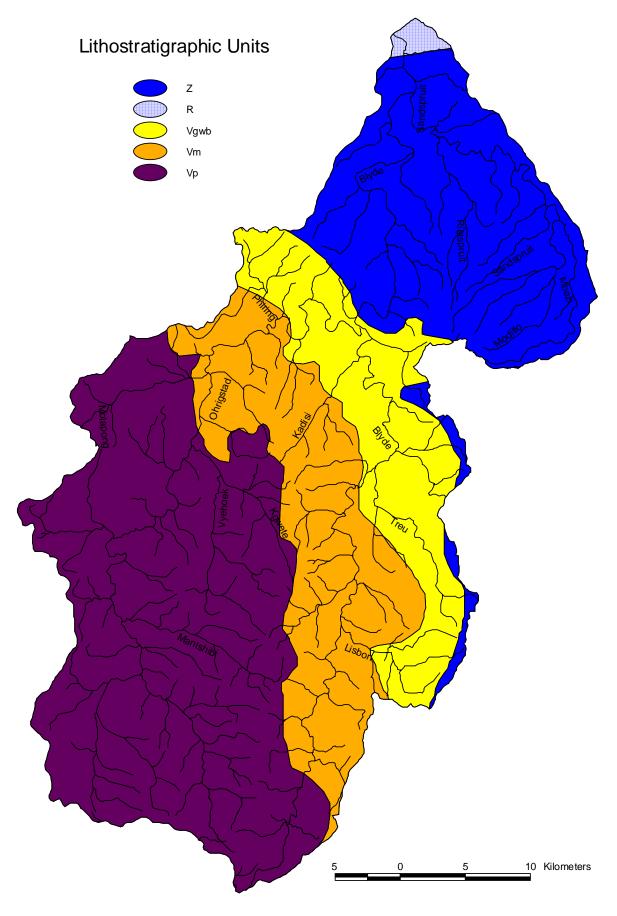


Figure 40. 1:250 000 rivers coverage for DWAF secondary catchment B6 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

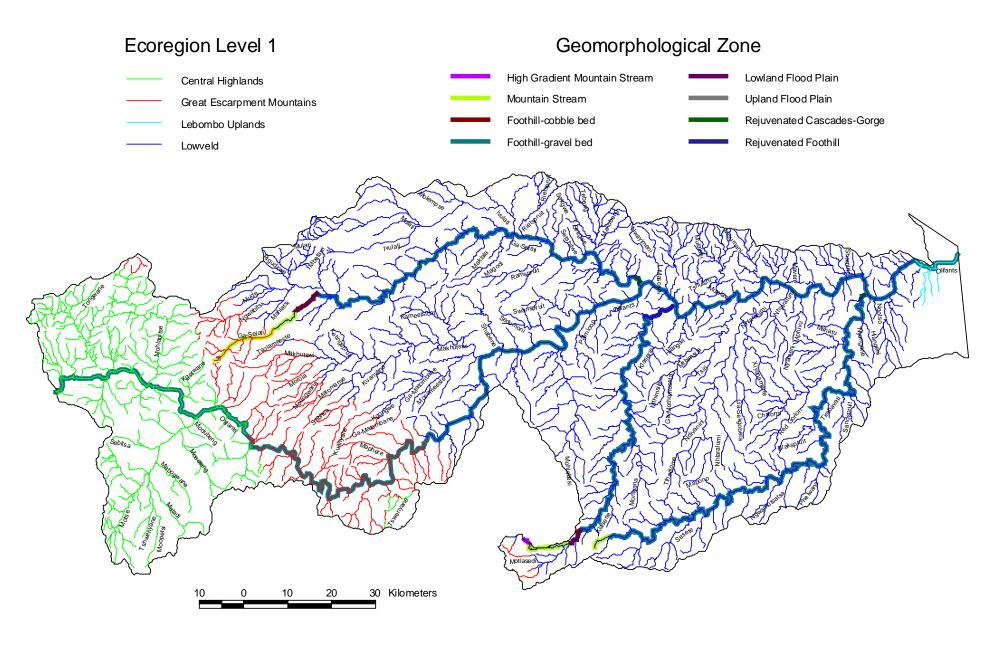


Figure 41. 1:250 000 rivers coverage for DWAF secondary catchment B7 coded by ecoregion level 1s and geomorphological zones.

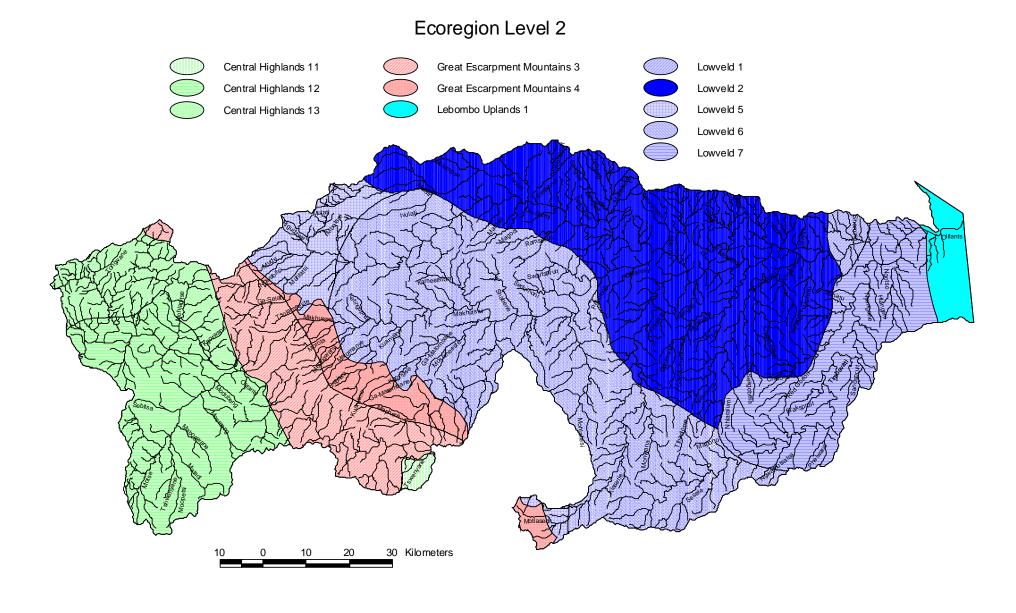


Figure 42. 1:250 000 rivers coverage for DWAF secondary catchment B7 showing ecoregion level 2s.

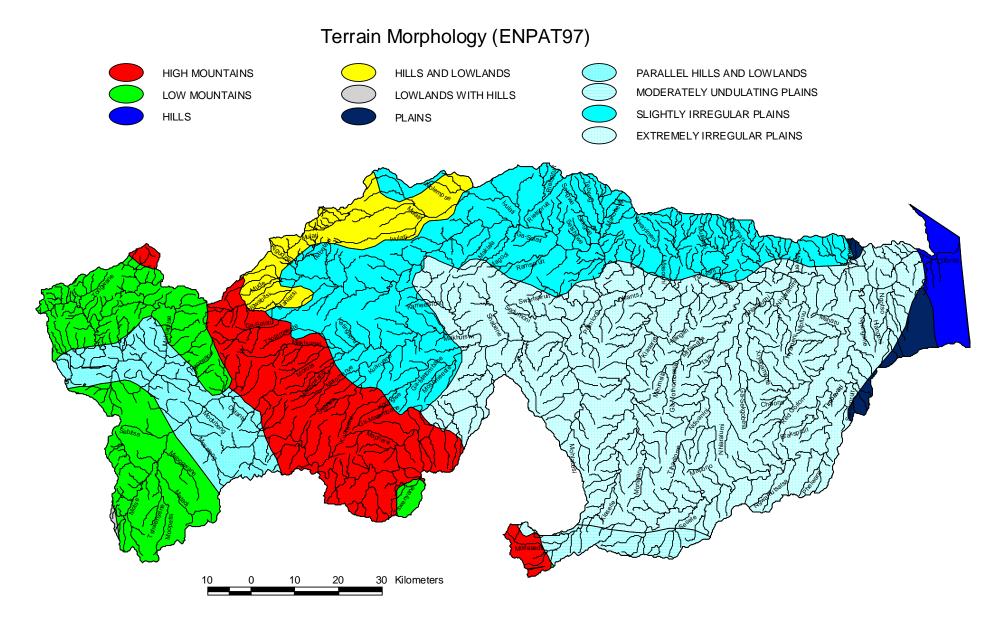


Figure 43. 1:250 000 rivers coverage for DWAF secondary catchment B7 showing terrain morphology (modified from Van Riet et al. 1997).

Vegetation (Low and Rebelo 1996)

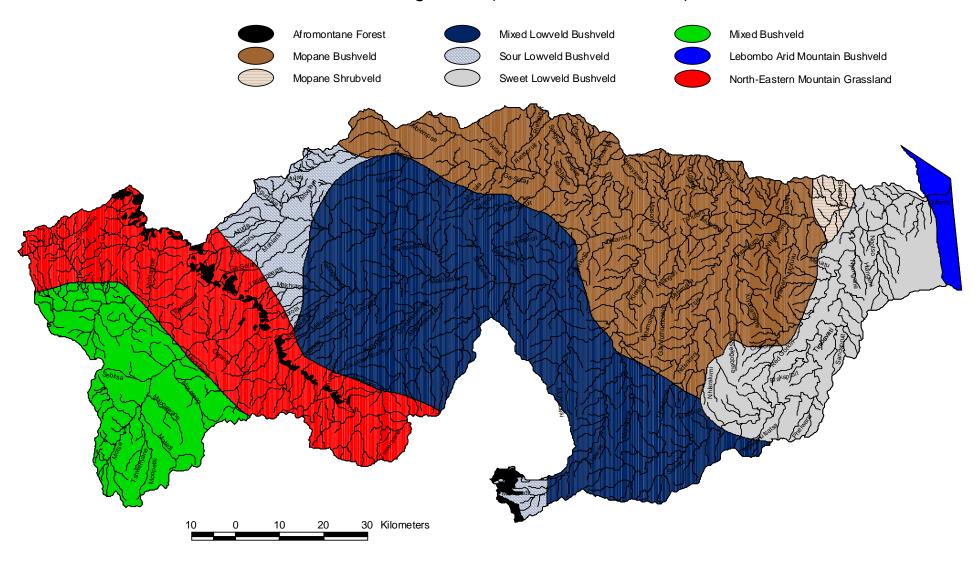


Figure 44. 1:250 000 rivers coverage for DWAF secondary catchment B7 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

Lithostratigraphic Units Rro Vm PTRu Vp Vru Vgwb 30 Kilometers

Figure 45. 1:250 000 rivers coverage for DWAF secondary catchment B7 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

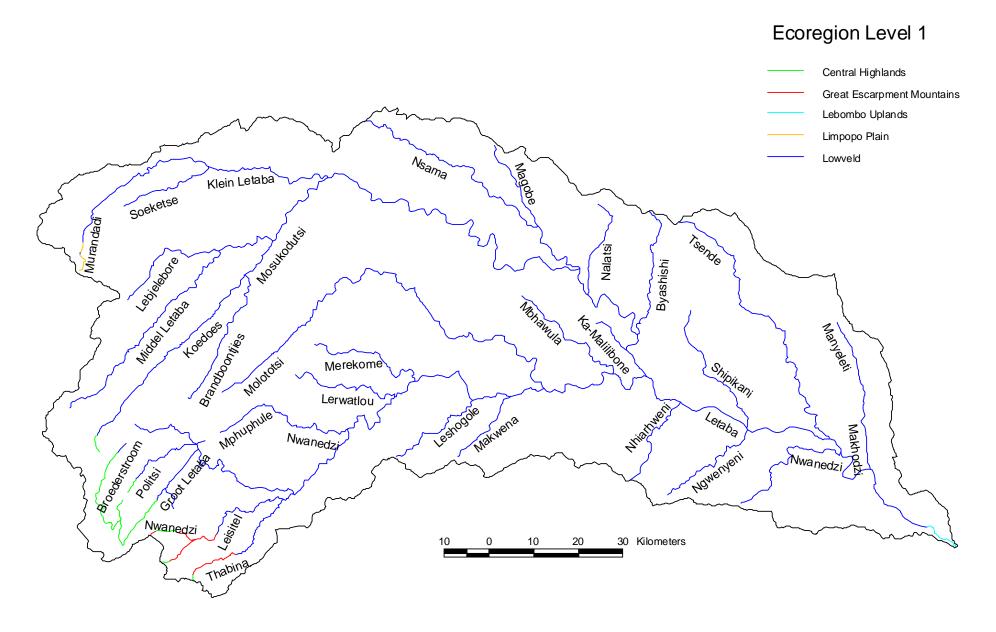


Figure 46. 1:500 000 rivers coverage for DWAF secondary catchment B8 coded by ecoregion level 1s.

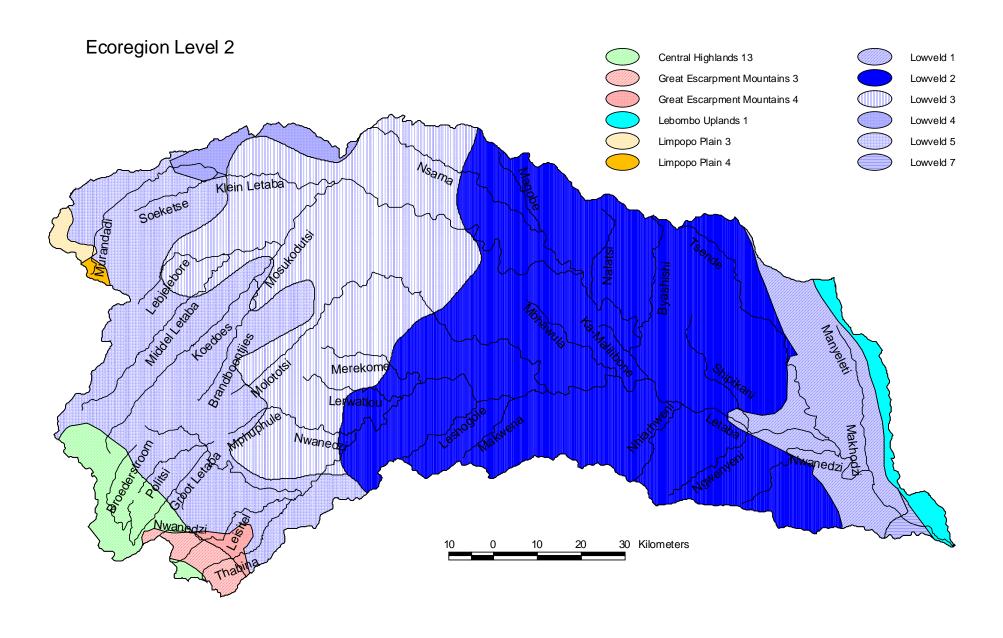


Figure 47. 1:500 000 rivers coverage for DWAF secondary catchment B8 showing ecoregion level 2s.

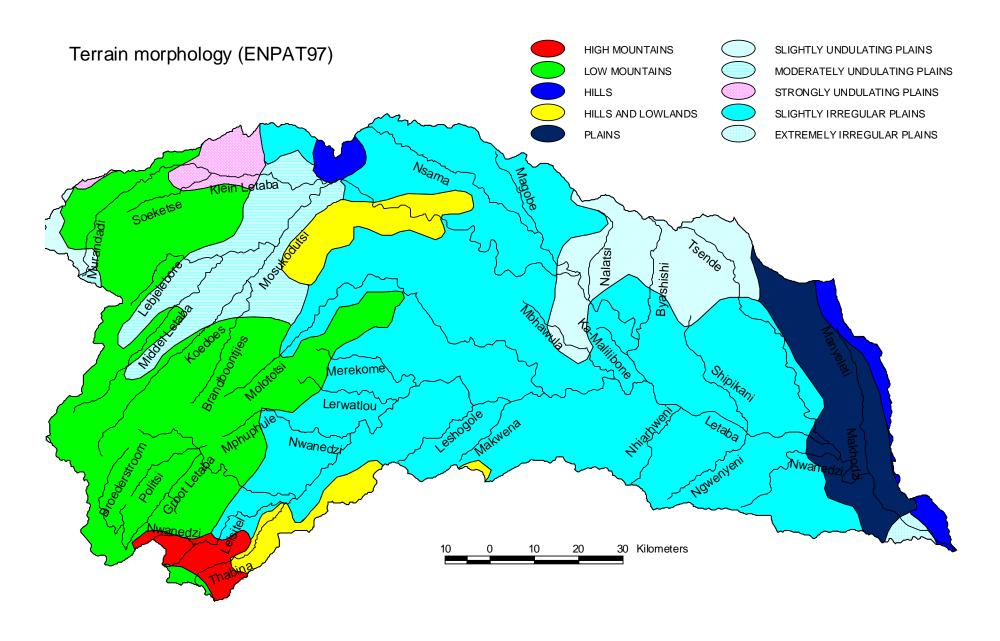


Figure 48. 1:500 000 rivers coverage for DWAF secondary catchment B8 showing terrain morphology (modified from Van Riet et al. 1997).

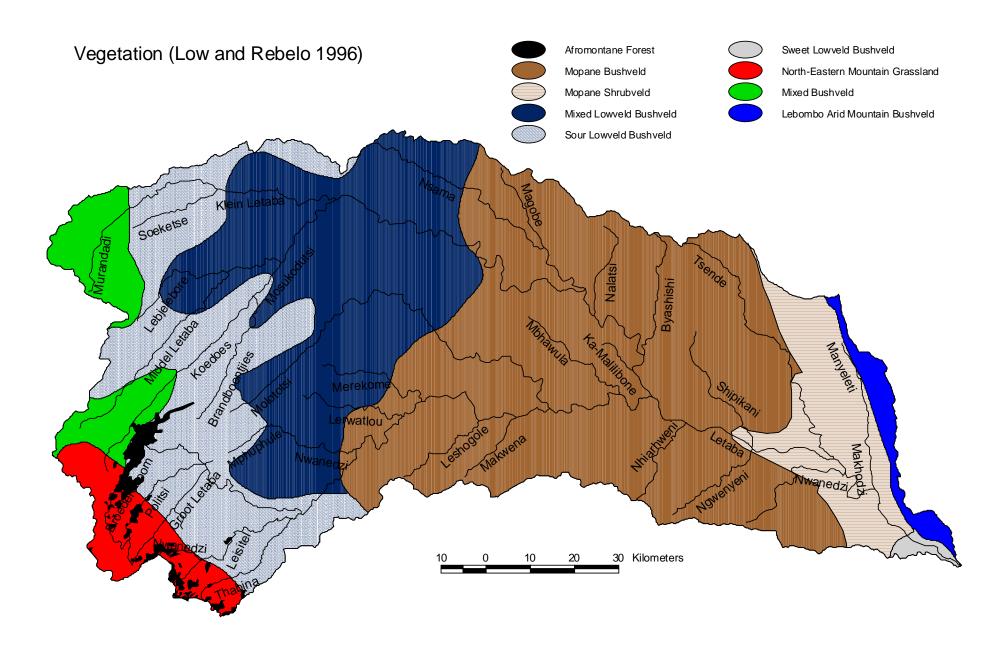


Figure 49. 1:500 000 rivers coverage for DWAF secondary catchment B8 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

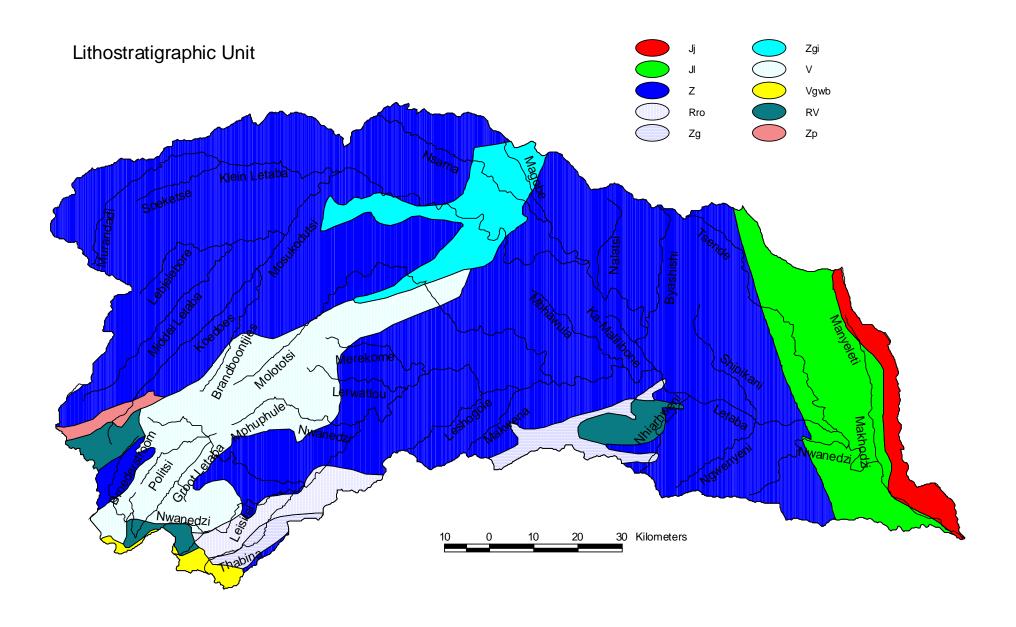


Figure 50. 1:500 000 rivers coverage for DWAF secondary catchment B8 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

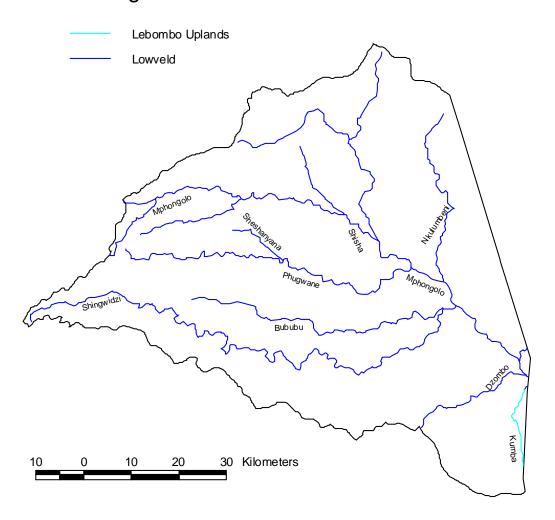


Figure 51. 1:500 000 rivers coverage for DWAF secondary catchment B9 coded by ecoregion level 1s .

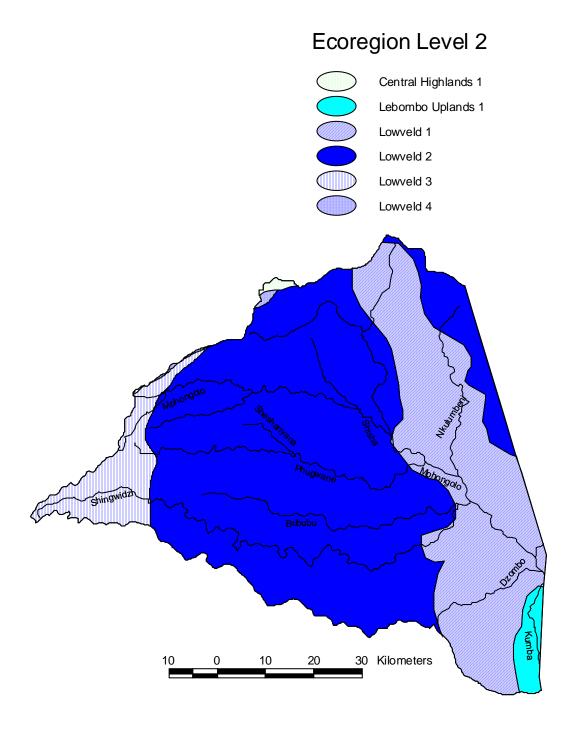


Figure 52. 1:500 000 rivers coverage for DWAF secondary catchment B9 showing ecoregion level 2s.

Terrain Morphology (ENPAT97)

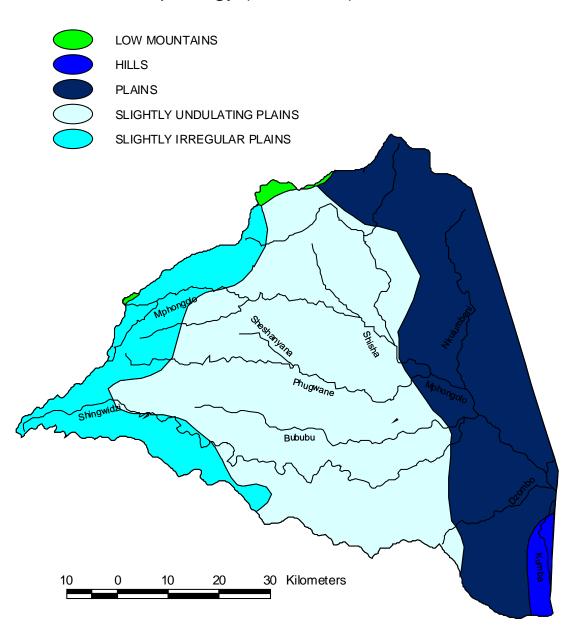


Figure 53. 1:500 000 rivers coverage for DWAF secondary catchment B9 showing terrain morphology (modified from Van Riet *et al.* 1997).

Vegetation (Low and Rebelo 1996)

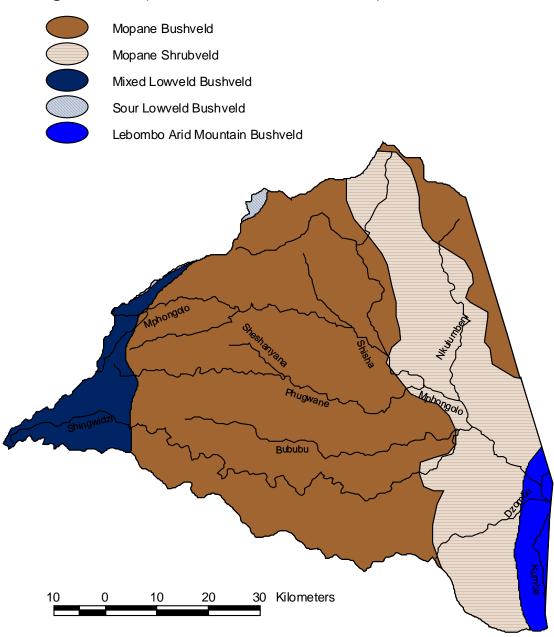


Figure 54. 1:500 000 rivers coverage for DWAF secondary catchment B9 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

Lithostratigraphic Unit

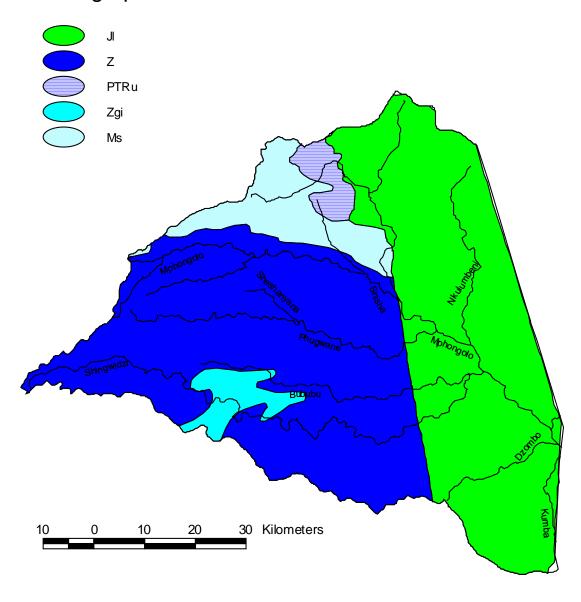


Figure 55. 1:500 000 rivers coverage for DWAF secondary catchment B9 showing lithostratigraphic units (modified from van Riet *et al.* 1997). Details of the lithostratigraphic units are given in Appendix 2.

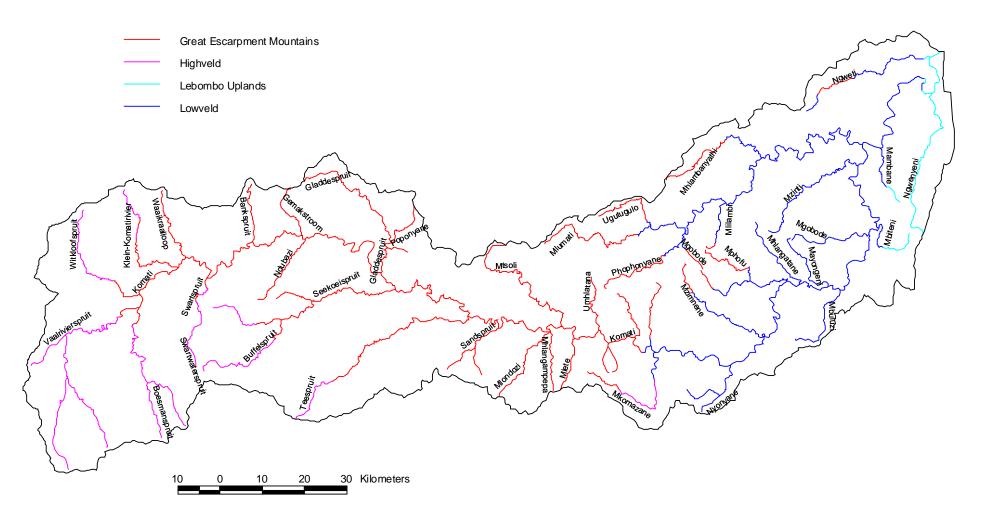


Figure 56. 1:500 000 rivers coverage for DWAF secondary catchment X1 coded by ecoregion level 1s.

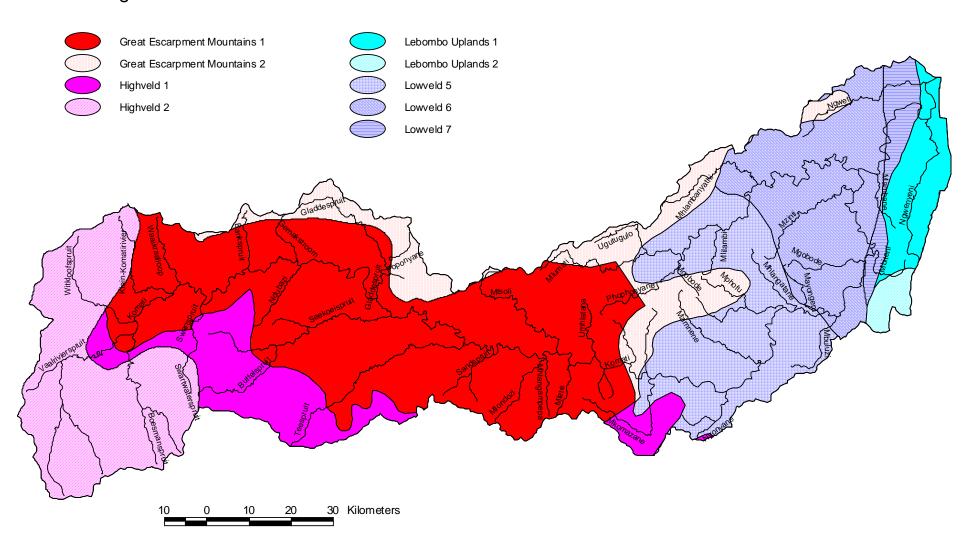


Figure 57. 1:500 000 rivers coverage for DWAF secondary catchment X1 showing ecoregion level 2s.

Terrain Morphology (ENAPT97)

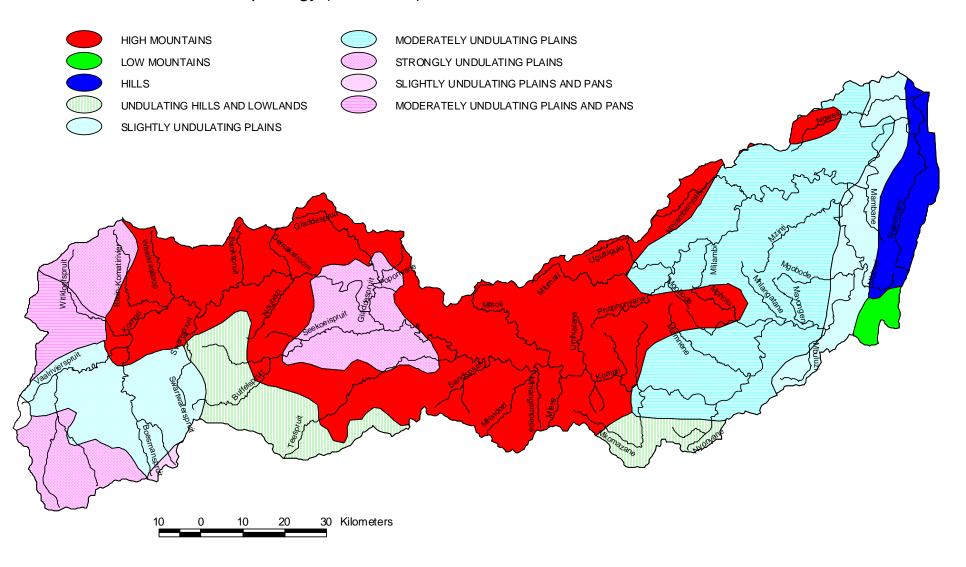


Figure 58. 1:500 000 rivers coverage for DWAF secondary catchment X1 showing terrain morphology (modified from Van Riet et al. 1997).

Vegetation (Low and Rebelo 1996)

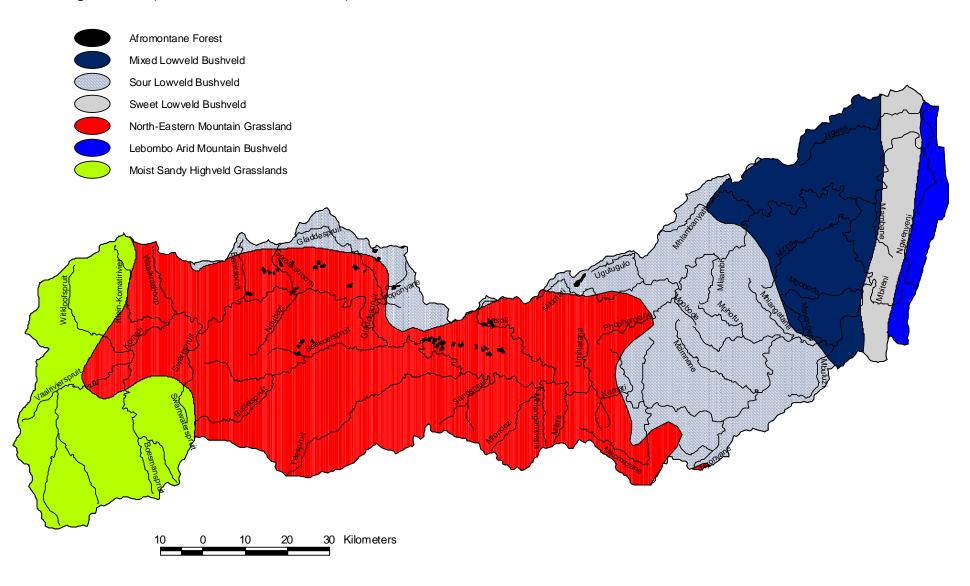


Figure 59. 1:500 000 rivers coverage for DWAF secondary catchment X1 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

Lithostratigraphic Units

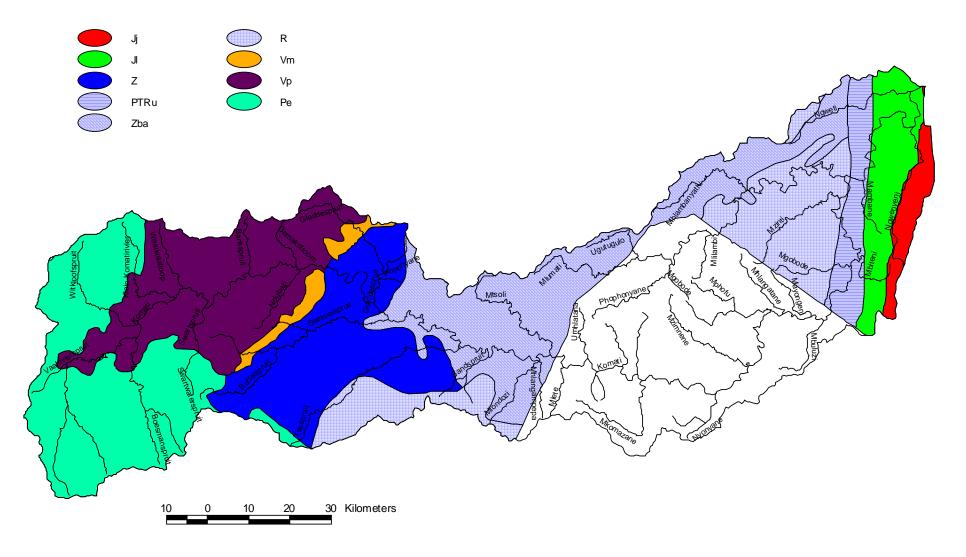


Figure 60. 1:500 000 rivers coverage for DWAF secondary catchment X1 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

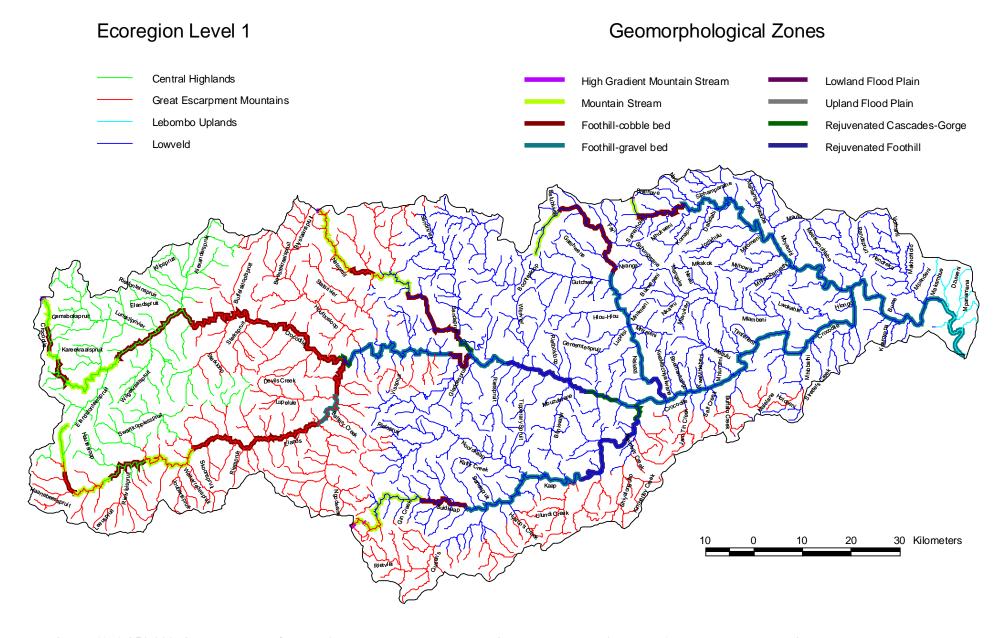


Figure 61. 1:250 000 rivers coverage for DWAF secondary catchment X2 coded by ecoregion level 1s and geomorphological zones.

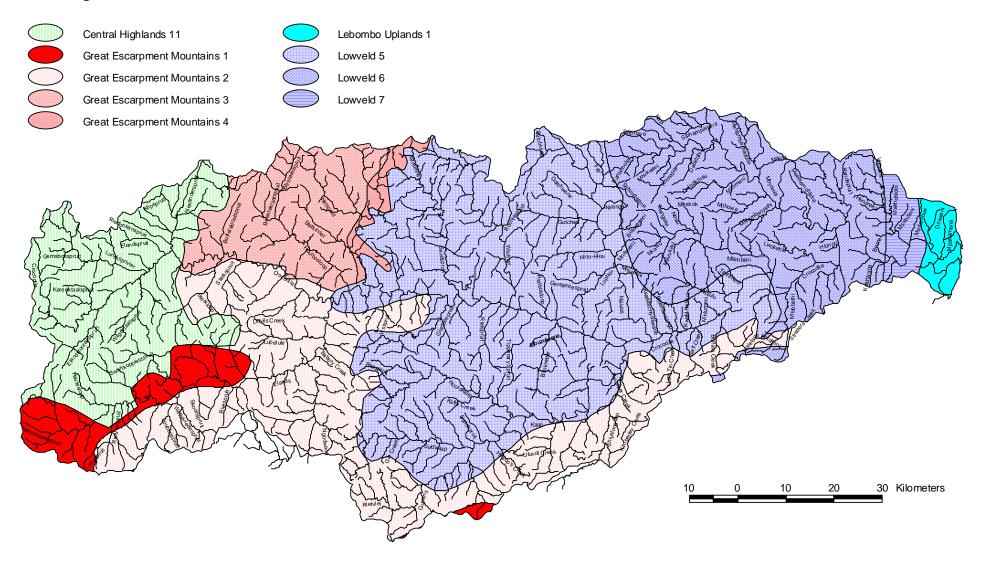


Figure 62. 1:250 000 rivers coverage for DWAF secondary catchment X2 showing ecoregion level 2s.

Terrain Morphology (ENPAT97)

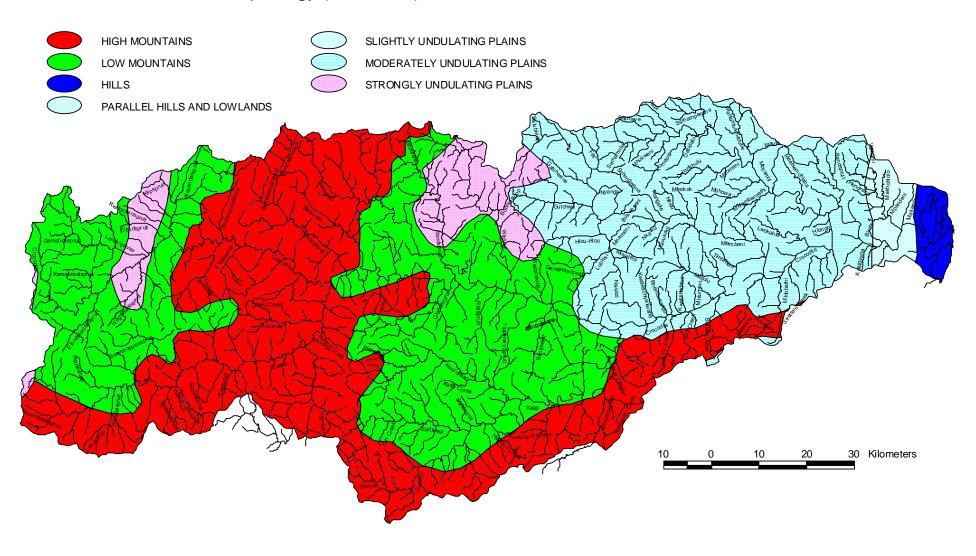


Figure 63. 1:250 000 rivers coverage for DWAF secondary catchment X2 showing terrain morphology (modified from Van Riet et al. 1997).

Vegetation (Low and Rebelo 1996)

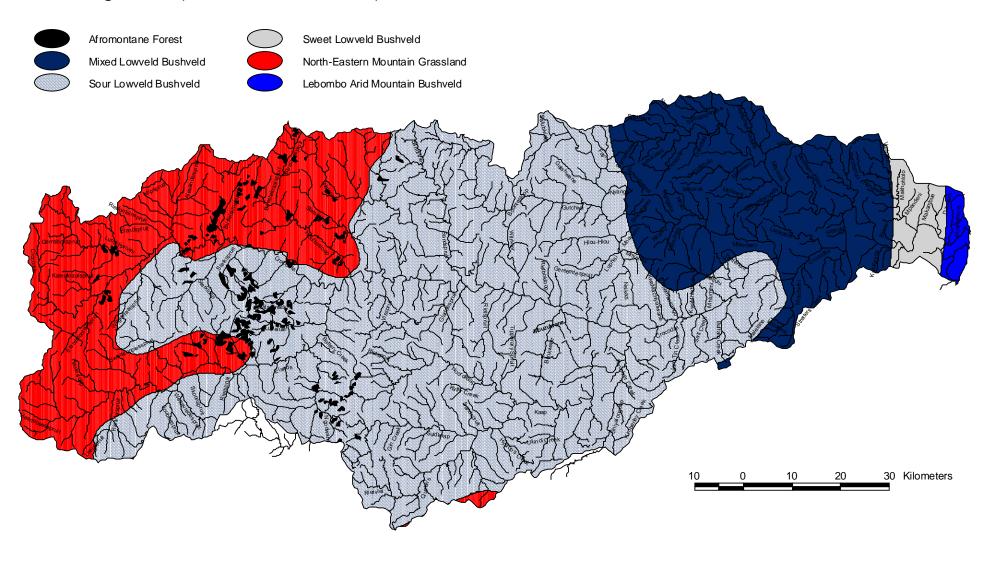


Figure 64. 1:250 000 rivers coverage for DWAF secondary catchment X2 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

Lithostratigraphic Units

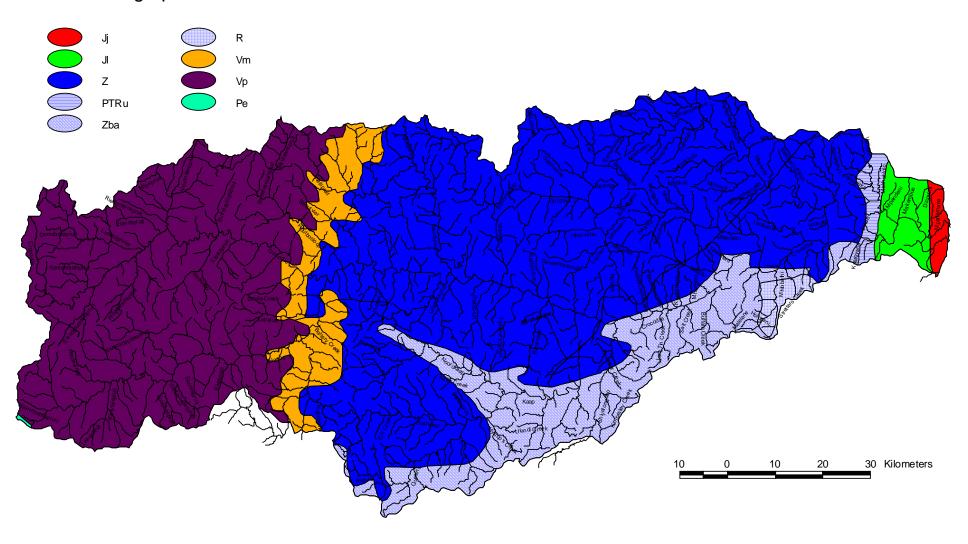
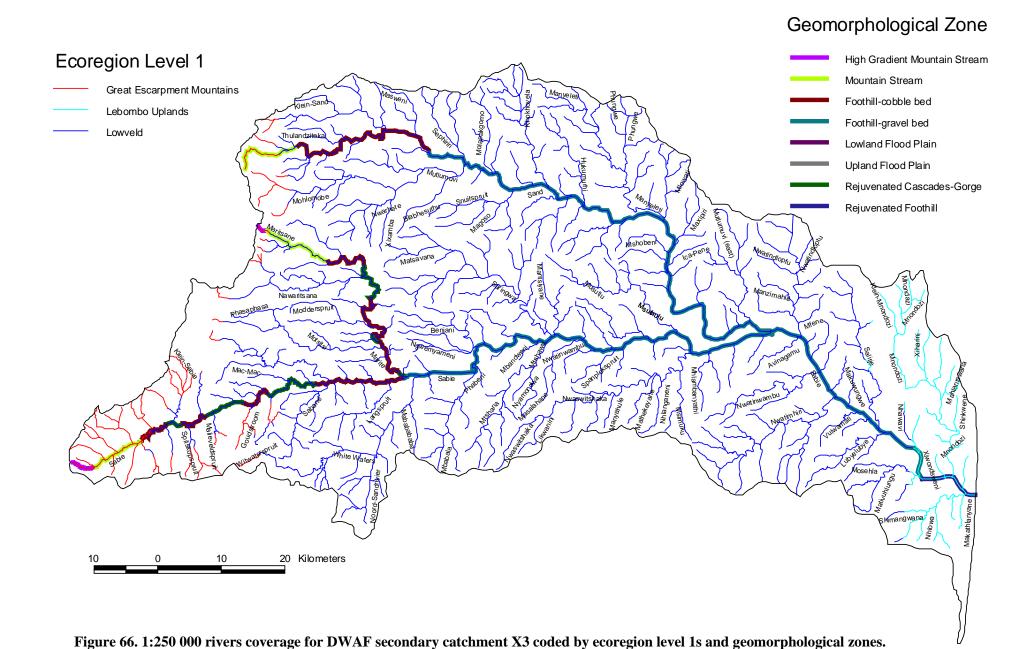


Figure 65. 1:250 000 rivers coverage for DWAF secondary catchment X2 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.



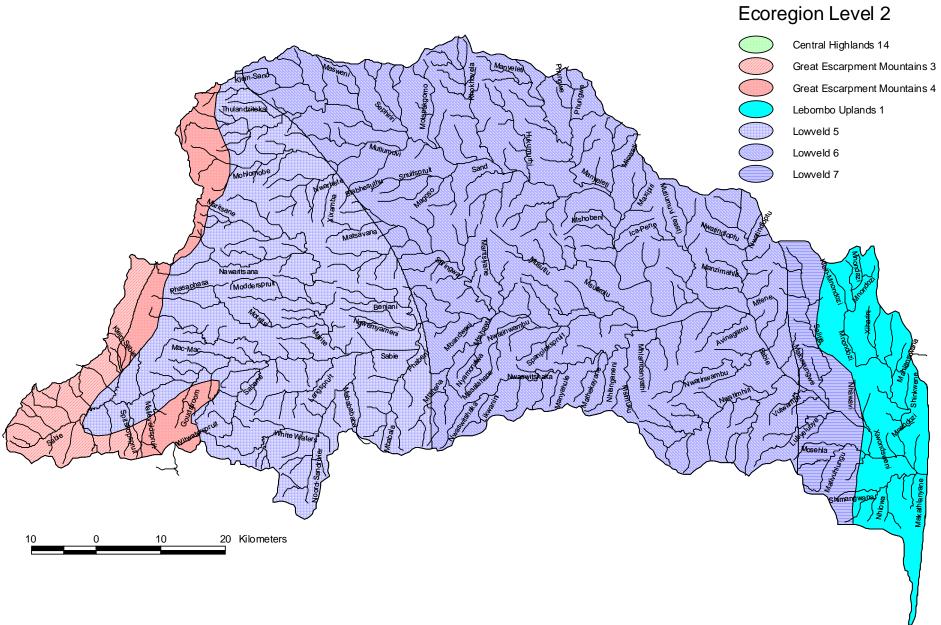


Figure 67. 1:250 000 rivers coverage for DWAF secondary catchment X3 showing ecoregion level 2s.

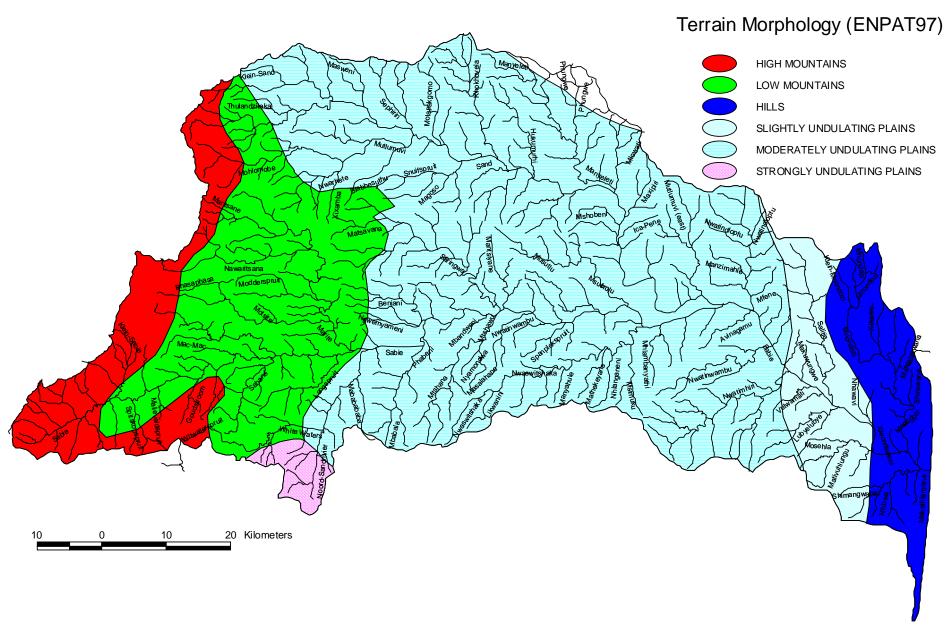


Figure 68. 1:250 000 rivers coverage for DWAF secondary catchment X3 showing terrain morphology (modified from Van Riet *et al.* 1997).

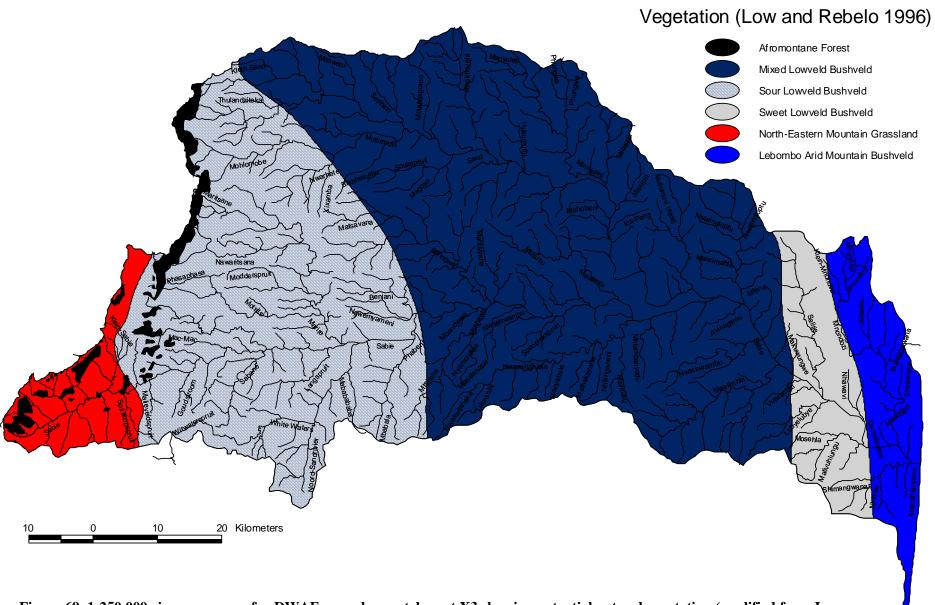


Figure 69. 1:250 000 rivers coverage for DWAF secondary catchment X3 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

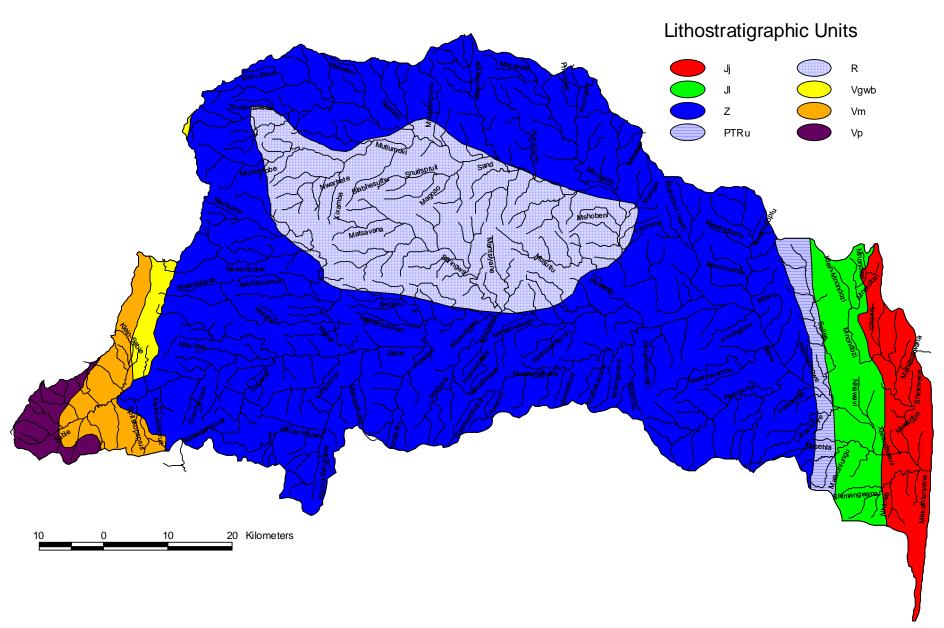


Figure 70. 1:250 000 rivers coverage for DWAF secondary catchment X3 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

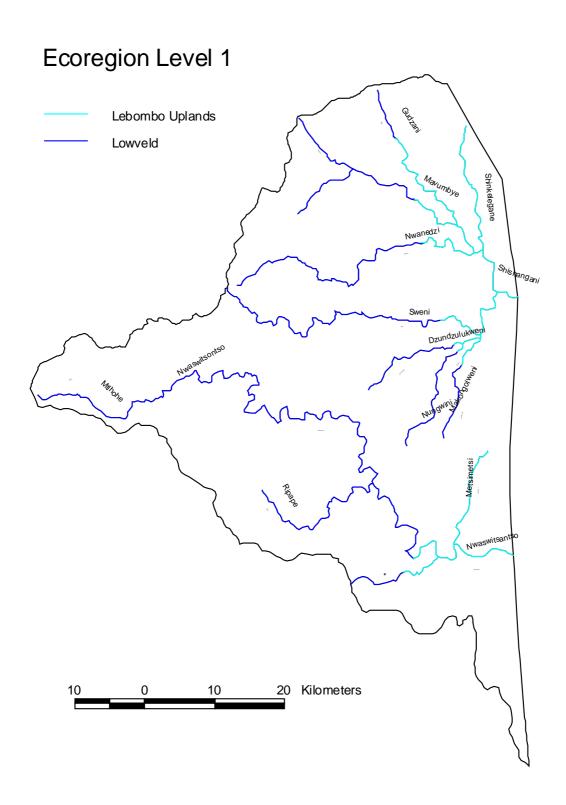


Figure 71. 1:500 000 rivers coverage for DWAF secondary catchment X4 coded by ecoregion level 1s.

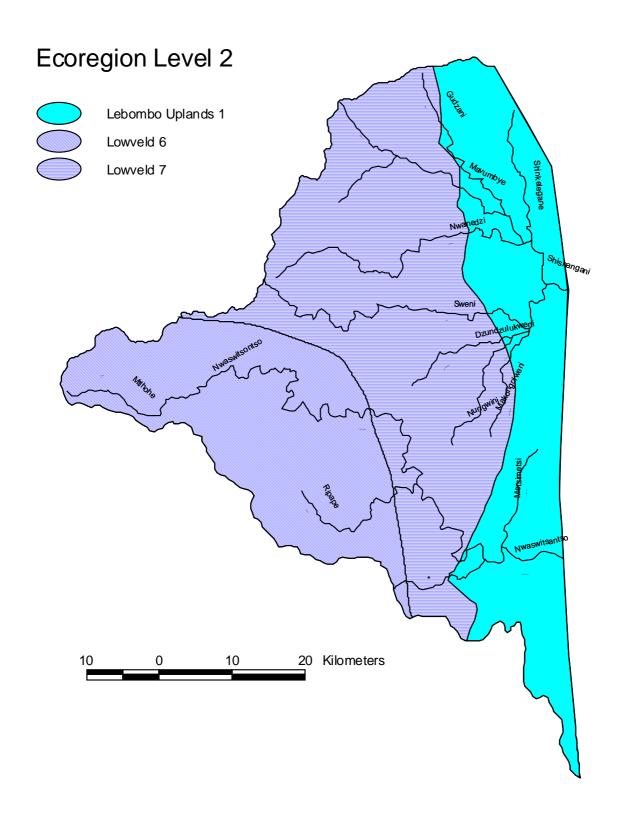


Figure 72. 1:500 000 rivers coverage for DWAF secondary catchment X4 showing ecoregion level 2s.

Terrain Morphology (ENPAT97)

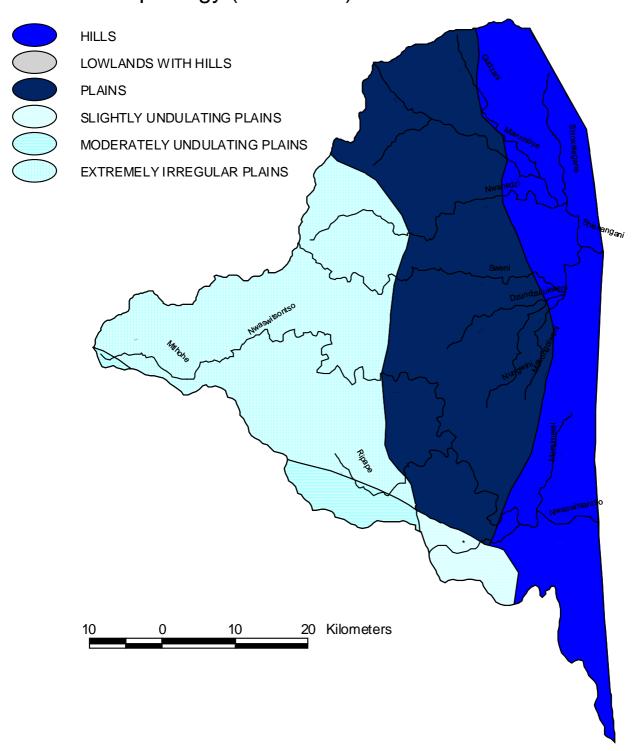


Figure 73. 1:500 000 rivers coverage for DWAF secondary catchment X4 showing terrain morphology (modified from Van Riet *et al.* 1997).

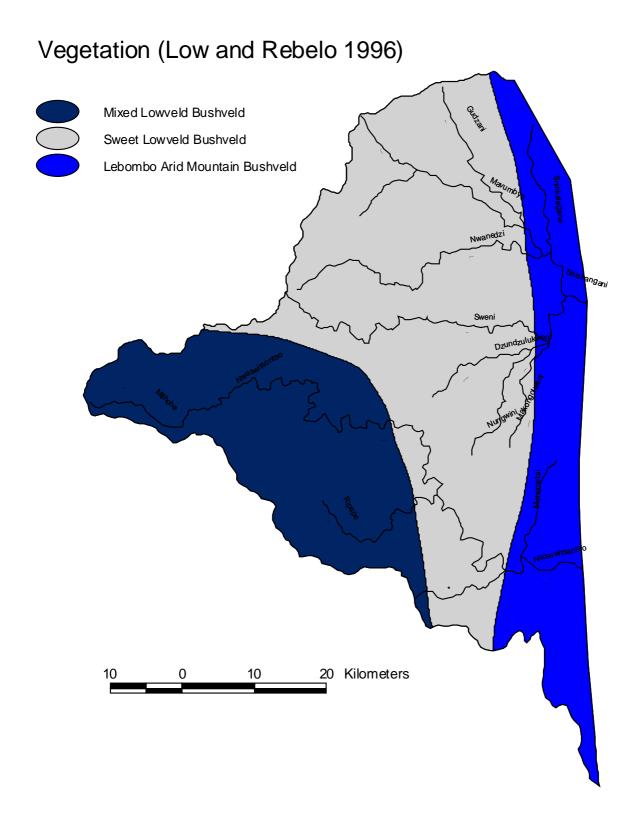


Figure 74. 1:500 000 rivers coverage for DWAF secondary catchment X4 showing potential natural vegetation (modified from Low and Rebelo 1996). Details of the vegetation are given in Appendix 1.

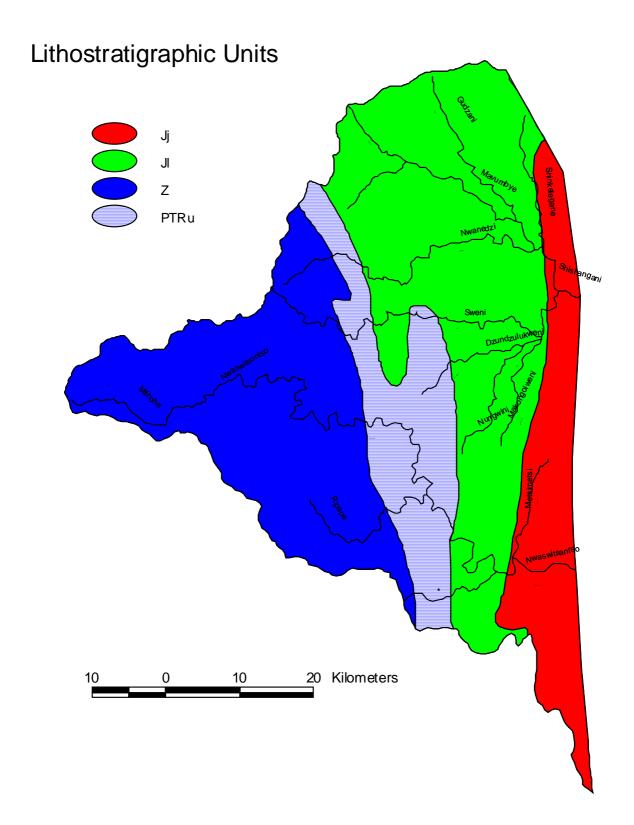


Figure 75. 1:500 000 rivers coverage for DWAF secondary catchment X4 showing lithostratigraphic units (modified from Vegter 1995). Details of the lithostratigraphic units are given in Appendix 2.

Table 4. Summary data for all named rivers at 1:250 000 scale for secondary catchments B1 to B7 and X2 and X3, and 1:500 000 scale for secondary catchments B8, B9, X1 and X4. Details related to each river's "parent" river, ecoregion level 1, vegetation type, lithostratigraphic unit and hydrological (Hyd) type (P=perennial and N=non-perennial, based on maps) are presented. Appendices 1 and 2 provide information pertaining to the vegetation types and lithostratigraphic units respectively.

River Name	Tributary of	2 ^o Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Alexanderspruit	Crocodile	X2	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Aneridsfonteinspruit	Klein-Olifants	B1	Highveld	Moist Sandy Highveld Grasslands	Vro, Pe	P
Avinagamu	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Bamboesloop	Elands	В3	Central Highlands	Mixed Bushveld	VMrl	N
Bankspruit	Olifants	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Bankspruit	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp	P
Battery Creek	Elands	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Vm, Z	P
Beestekraalspruit	Houtbosloop	X2	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Benjani	Ngwenyameni	X3	Lowveld	Sour Lowveld Bushveld	Z, R	P
Bhemansangu	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z, Zba	N
Blabhesuthu	Mutlumuvi	X3	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	R	P
Blesbokspruit	Klipspruit	B1	Highveld	Moist Sandy Highveld Grasslands, Rocky Highveld Grasslands	VMlw, Pe	P
Blesbokspruit	Rietspruit	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Blesbokspruit	Taalfonteinspruit	B2	Highveld	Rocky Highveld Grasslands	VMlw, CPd	N
Blinkwater	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z, Zba	P
Bloedrivier	Olifants	В3	Central Highlands	Mixed Bushveld, Moist Sandy Highveld Grasslands	Vru, VMrl	P
Blyde	Olifants	B6, B7	Great Escarpment Mountains, Lowveld	Afromontane Forest, Mixed Lowveld Bushveld, North- Eastern Mountain Grassland, Sour Lowveld Bushveld	Vgwb, Vp, Z, Vm, R	P
Blystaanspruit	Houtbosloop	X2	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Bobbejaanstroom	Selons	В3	Central Highlands, Highveld	Moist Sandy Highveld Grasslands, Rocky Highveld Grasslands	Vro, VMlw	P
Bob's River	Leisitel	В8	Central Highlands, Great Escarpment Mountains	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	V, RV	P
Bodimong	Olifants	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Boekenhoutloop	Olifants	В3	Central Highlands	Mixed Bushveld, Rocky Highveld Grasslands	VMlw	P
Boekenhoutspruit	Diepkloofrivier	В3	Central Highlands	Mixed Bushveld	Vro	N
Boesmanspruit	Olifants	B1	Highveld	Moist Sandy Highveld Grasslands	Pe, VMlw	P
Debeerspruit	Steenkoolspruit	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Devils Creek	Crocodile	X2	Great Escarpment Mountains	Afromontane Forest, Sour Lowveld Bushveld	Vp, Vm	P
Diepkloofrivier	Bloedrivier	В3	Bushveld Basin, Central Highlands	Mixed Bushveld, Moist Sandy Highveld Grasslands	VMrl, Vro	N
Diepsloot	Viskuile	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Dipetseng	Olifants	B5	Bushveld Basin	Mixed Bushveld	Vru, VMrl	N
Doringbergspruit	Dorpsrivier	B4	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Doringboomspruit	Klein-Olifants	B1	Central Highlands, Highveld	Rocky Highveld Grasslands	VMlw	P
Doringrivier	Nkumpi	В5	Bushveld Basin, Central Highlands	Clay Thorn Bushveld, Mixed Bushveld, North-Eastern Mountain Grassland	Vm, PTRu, Jl, Vgwb, V	P
Dorpsrivier	Spekboomrivier	B4	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Dwarsrivier	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld	Vru	P
Dzombo	Shingwidzi	В9	Lowveld	Mopane Bushveld, Mopane Shrubveld, Lebombo Arid Mountain Bushveld	Jl	N
Dzundzulukweni	Makongolweni	X4	Lebombo Uplands, Lowveld	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl, PTRu	N
Dzuweni	Crocodile	X2	Lebombo Uplands	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl	N
Elands	Olifants	В3	Bushveld Basin, Central Highlands, Highveld	Mixed Bushveld, Rocky Highveld Grasslands	PTRu, VMrl, Vt, Pe, Vro, VMlw	P
Elands	Crocodile	X2	Central Highlands, Great Escarpment Mountains, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp, Z, Vm	P
Elandsfonteinspruit	Crocodile	X2	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Elandspruit	Crocodile	X2	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Eloffspruit	Spekboomrivier	B4	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vp	N
eMcwebeni	Matjulu	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Enkeldoringspruit	Elands	В3	Bushveld Basin, Central Highlands	Mixed Bushveld	Vro, Vrw, VMrl	P
Fayi	Nsikazi	X2	Lowveld	Sour Lowveld Bushveld	Z	N
Frisgewaagriver	Nkumpi	B5	Central Highlands, Limpopo Plain	Mixed Bushveld, North-Eastern Mountain Grassland	Zp, RV, V	N
Frisgewaagspruit	Gemsbokspruit	В3	Central Highlands	Mixed Bushveld	VMrl, Vro	N
Gadzingwe	Shingwidzi	B9	Lowveld	Lebombo Arid Mountain Bushveld	Jl	N
Galgstroom	Tondeldoosloop	B4	Central Highlands	Mixed Bushveld	Vru	P
Gamakgatle	Puleng	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	VMrl	P
Ga-Matombane	Makhutswi	В7	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld	R, Z	N
Ga-Mothomosela	Mthimsila	В7	Lowveld	Mopane Bushveld	Z	N
Ga-Sekgobela	Nhlaralumi	В7	Lowveld	Mopane Bushveld, Sweet Lowveld Bushveld	Z	N
Ga-Selati	Olifants	В7	Great Escarpment Mountains, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld, Mixed Lowveld Bushveld,	Vgwb, Z, Vm, R	P

River Name	Tributary of	2 ^O Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
				Mopane Bushveld		
Gatshwene	Nsikazi	X2	Lowveld	Sour Lowveld Bushveld	Z	N
Gemakstroom	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp	P
Gemsbokspruit	Moses	В3	Bushveld Basin, Central Highlands, Highveld	Mixed Bushveld, Rocky Highveld Grasslands	VMrl, Vro	P
Gemsbokspruit	Malekani	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Gemsbokspruit	Lunsklipspruit	X2	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Gereemtespruit	Luphisi	X2	Lowveld	Sour Lowveld Bushveld	Z	N
Gifspruit	Kameel	В3	Central Highlands	Mixed Bushveld	VMrl	N
Gin Creek	SuidKaap	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Z	P
Gladdespruit	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vm, Z, Vp	P
Gladdespruit	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Goeihoopspruit	Klein-Olifants	B1	Highveld	Moist Sandy Highveld Grasslands	Vro	P
Goru	Motsephiri	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	VMrl	P
Gotwane	Elands	В3	Bushveld Basin, Central Highlands	Clay Thorn Bushveld, Mixed Bushveld	PTRu, Jl, Vro	P
Goudstroom	Sabie	Х3	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Z	P
Groenfontein se loop	Elands	В3	Bushveld Basin	Mixed Bushveld	Vro	P
Groot Letaba	Letaba	B8	Central Highlands, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld, Mixed Lowveld Bushveld, Mopane Bushveld	RV, V, Z, Rro	Р
Groot-Dwarsrivier	Dwarsrivier	B4	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vru, Vp	P
Grootfonteinspruit	Blyde	B6	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vm, Vp	P
Grootspruit	Saalboomspruit	B2	Highveld	Moist Cool Highveld Grasslands	VMlw	P
Grootspruit	Wilge	B2	Central Highlands, Highveld	Rocky Highveld Grasslands	VMlw, CPd	P
Grootspruit	Steelpoortrivier	B4	Highveld	Moist Sandy Highveld Grasslands	Vp, Vru	P
Gudzani	Mavumbye	X4	Lebombo Uplands, Lowveld	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl	N
Gutchwa	Nzikazi	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Haartebeesspruit	Elands	X2	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Hartebeesloop	Olifants	B1	Highveld	Moist Sandy Highveld Grasslands, Rocky Highveld Grasslands	VMlw, Pe, CPd	P
Hartebeesspruit	Elands	В3	Bushveld Basin	Mixed Bushveld	Vro, VMrl	P
Helsrivier	Olifants	В3	Central Highlands, Highveld	Rocky Highveld Grasslands	VMlw	P
Hendreka	Vurhami	X2	Lowveld	Mixed Lowveld Bushveld	PTRu, Z	N
Heuningspruit	Modderspruit	B4	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vp, Vru	P
Hlakaro	Olifants	B5	Bushveld Basin, Central Highlands, Limpopo Plain	Mixed Bushveld, North-Eastern Mountain Grassland	Vru, Vp, RV, Vgwb, Vm	N

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Hlangari	Olifants	В7	Lowveld	Mopane Bushveld	Z	N
Hlangeni	Timbavati	В7	Lowveld	Sweet Lowveld Bushveld	Jl	N
Hlongo	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Hlou-Hlou	Nsikazi	X2	Lowveld	Sour Lowveld Bushveld	Z	N
Hluvamaduba	Sabie	X3	Lowveld	Sour Lowveld Bushveld	Z	N
Hoduopon	Moopetsi	B4	Central Highlands	Mixed Bushveld	Vp	P
Holobeni	Stretters Creek	X2	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	R, Zba	N
Houtbosloop	Crocodile	X2	Great Escarpment Mountains, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp, Vm, Z	P
Hukumurhi	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z, R	N
Hyslop's Creek	SuidKaap	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Zba	N
Ica-Pene	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z, R	N
Ivulati	Ga-Selati	В7	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld, Sour Lowveld Bushveld	Zg, Z, R	P
Jabumane	Spekboomrivier	B4	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Jam Tin Creek	Crocodile	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Zba	P
Joubertspruit	Elands	X2	Great Escarpment Mountains	Sour Lowveld Bushveld	Vp	P
Jozikhulu	Mikskok	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Ka- Nwatimfenhe	Timbavati	В7	Lowveld	Sweet Lowveld Bushveld	Z	N
Kaap	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z, Zba	P
Kadisi	Blyde	В6	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vgwb, Vm, Vp	P
Kaffir Creek	Noordkaap	X2	Lowveld	Sour Lowveld Bushveld	Z, Zba	P
Ka-Malilibone	Klen Letaba	B8	Lowveld	Mopane Bushveld	Z	N
Kameel	Elands	В3	Bushveld Basin, Central Highlands	Mixed Bushveld	VMrl, Vro	P
Kameelsloot	Makhutswi	B7	Lowveld	Mixed Lowveld Bushveld	Z, Zg	N
Ka-Nwatinhlarhu	Timbavati	В7	Lowveld	Sweet Lowveld Bushveld	Z	N
Kareekraalspruit	Crocodile	X2	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Keeromspruit	Klein-Olifants	B1	Central Highlands, Highveld	Rocky Highveld Grasslands, Moist Sandy Highveld Grasslands	VMlw, Vro	P
Ketingspruit	Makhutswi	B7	Lowveld	Mixed Lowveld Bushveld	Z, Zg	N
Kgobokwane	Elands	В3	Central Highlands	Mixed Bushveld	VMrl, Pe, Vg	N
Kgongwe	Ga-Matombane	В7	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld, North-Eastern Mountain Grassland	R	N
Kgotswane	Bodimong	B5	Bushveld Basin	Mixed Bushveld	VMrl	N
Kgotswane	Olifants	В7	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland	Vm, Vp	N

River Name	Tributary of	2 ^o Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Kgwete	Ohrigstad	В6	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Khokhovela	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z	P
Kimberley Creek	Shiyalongubo	X2	Great Escarpment Mountains	Sour Lowveld Bushveld	Zba	P
Klaserie	Olifants	В7	Great Escarpment Mountains, Lowveld	Afromontane Forest, Sour Lowveld Bushveld, Mixed Lowveld Bushveld, Mopane Bushveld	Z	P
Klein Letaba	Letaba	В8	Lowveld, Limpopo Plain	Mixed Bushveld, Sour Lowveld Bushveld, Mixed Lowveld Bushveld, Mopane Bushveld	Z, Zgi	P
Klein-Dwarsrivier	Dwarsrivier	B4	Central Highlands	Mixed Bushveld	Vru	P
Klein-Komatirivier	Komati	X1	Great Escarpment Mountains, Highveld	North-Eastern Mountain Grassland, Moist Sandy Highveld Grasslands	Pe, Vp	P
Klein-Mnondozi	Mnondozi	Х3	Lebombo Uplands	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl	N
Klein-Olifants	Olifants	B1	Central Highlands, Highveld	Rocky Highveld Grasslands, Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	VMlw, Pe, Vro	P
Klein-Sabie	Sabie	Х3	Great Escarpment Mountains, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vm, Vgwb	P
Klein-Sand	Sand	X3	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N
Klein-Spekboomrivier	Spekboomrivier	B4	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Kleinspruit	Dorpsrivier	B4	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Klipdrift	Moses	В3	Central Highlands	Mixed Bushveld	Vro	N
Klipfonteinspruit	Wilge	B2	Highveld	Moist Cool Highveld Grasslands	Vp, Pe	N
Kliprivier	Olifants	В3	Central Highlands, Highveld	Mixed Bushveld, Moist Sandy Highveld Grasslands, Rocky Highveld Grasslands	Vro, VMlw	P
Kliprivier	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vru, Vp	P
Klipspruit	Olifants	B1	Central Highlands, Highveld	Rocky Highveld Grasslands, Moist Sandy Highveld Grasslands	VMlw, Pe	P
Klipspruit	Bronkhorstspruit	B2	Highveld	Moist Cool Highveld Grasslands, Moist Sandy Highveld Grasslands	Vp, Pe	P
Klipspruit	Gemsbokspruit	В3	Bushveld Basin, Central Highlands	Mixed Bushveld	VMrl, Vro	P
Klipspruit	Selons	В3	Central Highlands	Moist Sandy Highveld Grasslands	Vro	P
Klipspruit	Alexanderspruit	X2	Central Highlands	North-Eastern Mountain Grassland	Vp	N
Koedoes	Mosukodutsi	В8	Central Highlands, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Mixed Bushveld, Sour Lowveld Bushveld	RV, Z, Zp	N
Komapiti	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Komati		X1	Great Escarpment Mountains, Lebombo Uplands, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld, Sweet Lowveld Bushveld, Mixed Lowveld Bushveld, Lebombo Arid Mountain Bushveld	Vp, Zba, Z, Jl, Jj, PTRu, R	P
Koringspruit	Olifants	B1	Highveld	Moist Sandy Highveld Grasslands	Pe	P

River Name	Tributary of	2 ^o Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Kromdraaispruit	Wilge	B2	Central Highlands, Highveld	Moist Sandy Highveld Grasslands, Rocky Highveld Grasslands, Moist Clay Highveld Grasslands	VMlw, Pe	P
Kruisrivier	Selons	В3	Central Highlands	Moist Sandy Highveld Grasslands	Vru, Vro	P
Kuanyane	Makhutswi	В7	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld, North-Eastern Mountain Grassland	R, Z	N
Kumba	Shingwidzi	B9	Lowveld Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jl	N
KuMoyana	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld	PTRu	N
Kwa Mfamehlo	Phabeni	X3	Lowveld	Sour Lowveld Bushveld	Z	P
KwaMachiyaliwane	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld	Z, Zba	N
KwaMhlebeni	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z, Zba	N
Kwerere	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld	Vp	N
Langspruit	Unspecified	B4	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Langspruit	Sabie	Х3	Lowveld	Sour Lowveld Bushveld	Z	P
Lebjelebore	Middle Letaba	В8	Lowveld	Sour Lowveld Bushveld, Mixed Lowveld Bushveld	Z	N
Leeuspruit	Rietvleispruit	X2	Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp	P
Leisitel	Groot Letaba	В8		Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	RV, Vgwb, V, Rro, Z	P
Lepellane	Olifants	B5	Bushveld Basin	Mixed Bushveld	Vru	Р
Lerwatlou	Groot Letaba	B8	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z, V	N
Leshogole	Groot Letaba		Lowveld	Mopane Bushveld	Z	N
Letaba	Olifants		Lebombo Uplands, Lowveld	Sweet Lowveld Bushveld, Mopane Bushveld, Mopane Shrubveld	Jl, Jj, Z, Zg	P
Likwanini	Nwaswitshaka	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Lisbon	Blvde	В6	Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vgwb, Vm	P
Longstrekloop	Boekenhoutloop	В3	Central Highlands	Rocky Highveld Grasslands	VMlw	P
Loopspruit	Hartebeespruit	В3	Bushveld Basin, Highveld	Mixed Bushveld, Rocky Highveld Grasslands	Vro, VMrl, VMlw, CPd	Р
Lubyelubye	Sabie	X3	Lowveld	Mixed Lowveld Bushveld, Sweet Lowveld Bushveld	Z, PTRu	N
Lunsklip	Crocodile	X2	Central Highlands	Afromontane Forest, North-Eastern Mountain Grassland	Vp	P
Lupelule	Elands	X2	Central Highlands, Great Escarpment Mountains	Afromontane Forest, Sour Lowveld Bushveld	Vp, Vm, Z	P
Luphisi	Nsikazi	X2	Lowveld	Sour Lowveld Bushveld	Z	N
Lwokahle	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Mababababa	Noord-Sandrivier		Lowveld	Sour Lowveld Bushveld	Z	N
Mabitsana	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vp	N
Mabitse	Politsi	B8	Lowveld	Afromontane Forest, Sour Lowveld Bushveld	V	N
Mabogwane	Motse	B7	Central Highlands	Mixed Bushveld	Vru	N
Macetse	Mulalani	B7	ŭ	Mopane Bushveld	Z	N
Mac-Mac	Sabie		Lowveld	Afromontane Forest, Sour Lowveld Bushveld	Z	P

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Madibele	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld	Vru	P
Magobe	Nsama	B8	Lowveld	Mopane Bushveld	Z, Zgi	N
Magodi	Ga-Selati	B7	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z, R	N
Magoso	Snuifspruit	X3	Lowveld	Mixed Lowveld Bushveld	R	P
Mahlambamadube	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Mahlantswana	Mnondozi	X3	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jj	N
Mahlatsi	Ngwabitsi	В7	Great Escarpment Mountains, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Z	N
Makambue	Crocodile	X2	Lebombo Uplands, Lowveld	Sweet Lowveld Bushveld	Jl	N
Makathlanyane	Nhlowa	X3	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jj	N
Makhodzi	Letaba	В8	Lowveld	Mopane Shrubveld	Jl	N
Makhohlolo	Vurhami	X2	Lowveld	Sweet Lowveld Bushveld	PTRu	N
Makhutswi	Olifants	В7	Great Escarpment Mountains, Lowveld	Afromontane Forest, Mixed Lowveld Bushveld, North- Eastern Mountain Grassland, Sour Lowveld Bushveld	Vgwb, Z, Zg	N
Maklala	Ga-Selati	В7	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	R	N
Makobeng	Tebeng	В7	Lowveld	Mopane Bushveld	Z	N
Makongolweni	Shishangale	X4	Lebombo Uplands, Lowveld	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl, Jj	Р
Makotswane	Olifants	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Makuwungwe	Salitje	X3	Lowveld	Sweet Lowveld Bushveld	PTRu	N
Makwena	Groot Letaba	B8	Lowveld	Mopane Bushveld	Z	N
Malanspruit	Elands	В3	Bushveld Basin	Mixed Bushveld, Rocky Highveld Grasslands	VMlw, CPd	P
Malekani	Motsephiri	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Malelane	Crocodile	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Zba	N
Malieveldspruit	Sabie	Х3	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Z	N
Malomanye	Kuanyane	В7	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld, North-Eastern Mountain Grassland	Z, R, Vgwb	N
Mambane	Komati	X1	Lowveld, Lebombo Uplands	Sweet Lowveld Bushveld, Mixed Lowveld Bushveld	Jl, PTRu	N
Mametse	Moses	В3	Central Highlands	Mixed Bushveld	Vru, VMrl, Vt	N
Mamoswane	Gamakgatle	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	VMrl	P
Mangake	Mlambeni	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Mantshibi	Ohrigstad	В6	Central Highlands, Great Escarpment Mountains	Afromontane Forest, North-Eastern Mountain Grassland	Vp	P
Mantsiyane	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	R	N
Manyahule	Nwaswitshaka	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Manyeleti	Makhodzi	B8	Lowveld	Lebombo Arid Mountain Bushveld, Mopane Shrubveld	Jj, Jl	N
Manyeleti	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z	N

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Manyukelani	Olifants	В7	Lowveld	Mopane Bushveld	Z	N
Manzimahle	Nwatindlopfu	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Maphere	Olifants	В7	Great Escarpment Mountains	Afromontane Forest, Mixed Lowveld Bushveld, North- Eastern Mountain Grassland	Vgwb, Z, R	N
Mapono	Nhlaralumi	В7	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z	N
Marambane	Dorpsrivier	B4	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Marethateng	Rietspruit	В7	Lowveld	Mopane Bushveld	Zg, R	N
Marite	Sabie	X3	Lowveld	Sour Lowveld Bushveld	Z, R	P
Maritsane	Marite	Х3	Great Escarpment Mountains, Lowveld	Afromontane Forest, Sour Lowveld Bushveld	Z, R	P
Masalahane	Nyamondwu	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Mashangani	Masorini	В7	Lowveld	Mopane Bushveld	Z	N
Mashukele	Nwatinwambu	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Masokololo	Malanspruit	В3	Bushveld Basin, Highveld	Mixed Bushveld, Rocky Highveld Grasslands	VMlw	P
Masorini	Olifants	В7	Lowveld	Mopane Bushveld	Z	N
Masweni	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Matadi	Moopetsi	В7	Central Highlands	Mixed Bushveld	Vp, Vru	N
Matebejane	Chuniesriver	B5	Central Highlands	Mixed Bushveld	RV, Vgwb	N
Mathekeyane	Nwaswitshaka	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Matimachwewu	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Mativuhlungu	Sabie	X3	Lebombo Uplands, Lowveld	Sweet Lowveld Bushveld	Jl, PTRu, Z	N
Matlakatle	Ngwaritsi	B5	Bushveld Basin	Mixed Bushveld	VMrl	N
Matsavana	Saringwa	X3	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	R	P
Maulu	Mahlambamadube	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Maveni	Olifants	В7	Lowveld	Mopane Bushveld	Z	N
Mavukani	Mlambeni	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Mavumbye	Nwanedzi	X4	Lebombo Uplands, Lowveld	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	J1	N
Maxipiri	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Mayongeni	Komati	X1	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	R	N
Mbabala	Kwa Mfamehlo	X3	Lowveld	Sour Lowveld Bushveld	Z	P
Mbandweni	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Mbetani	Rigudzwe	В7	Lowveld	Sour Lowveld Bushveld	Z, Zg	N
Mbezi	Sandspruit	В6	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N
Mbhawula	Groot Letaba	В8	Lowveld	Mopane Bushveld	Z	N
Mbiteni	Komati	X1	Lowveld, Lebombo Uplands	Sweet Lowveld Bushveld, Lebombo Arid Mountain Bushveld	Jl, Jj, PTRu	P
Mbuluzi	Komati	X1	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld		P

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Mbuzulwane	Blinkwater	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Mbyamiti	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Meeste Matau	Tondeldoosloop	B4	Central Highlands	Mixed Bushveld	Vru	N
Meetsemohlaba	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Merekome	Groot Letaba	B8	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z, V	N
Metsimetsi	Nwaswitsantso	X4	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jj	N
Mfene	Nwatindlopfu	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Mgobode	Komati	X1	Lowveld	Mixed Lowveld Bushveld, Sweet Lowveld Bushveld	PTRu, R	N
Mgobode	Phophonyane	X1	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld		N
Mhlambanyathi	Mlumati	X1	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Zba	N
Mhlambanyathi	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Mhlambanyathi	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Mhlangampepa	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland	Zba	P
Mhlangatane	Komati	X1	Lowveld	Sour Lowveld Bushveld		N
Mhlobathi	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld	Zba, R	N
Mhlumeni	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z, Zba	N
Mhukweni	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Middel Letaba	Klein Letaba	В8	Lowveld	Mixed Bushveld, Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	P
Mikskok	Mitomeni	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Misumani	Olifants	В7	Lowveld	Mopane Bushveld	Z	N
Mitomeni	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	P
Mkomazane	Komati	X1	Great Escarpment Mountains, Highveld, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld		N
Mlete	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland		P
Mlilambi	Mlumati	X1	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld		P
Mlondozi	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland	Zba, R	N
Mlowati	Manyeleti	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Mlumati	Komati	X1	Great Escarpment Mountains, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld, Mixed Lowveld Bushveld	Zba, R	P
Mmamerela	Tlhabasane	В5	Limpopo Plain	Mixed Bushveld	RV, Z	N
Mmantlhwe	Lepellane	В5	Bushveld Basin	Mixed Bushveld	Vru	P
Mnameni	Nsikazi	X2	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N
Mnondozi	Sabie	X3	Lebombo Uplands	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	JI	N
Mnyeleni	Nsikazi	X2	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Modderspruit	Wilge	B2	Highveld	Moist Cool Highveld Grasslands	Vp	Е
Modderspruit	Witpoortrivier	B4	Central Highlands	Mixed Bushveld	Vru	P
Modderspruit	Marite	X3	Lowveld	Sour Lowveld Bushveld	Z	P
Moditlo	Mbezi	В6	Lowveld	Afromontane Forest, Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N
Modubeng	Olifants	В7	Central Highlands	North-Eastern Mountain Grassland	Vp	N
Moganyake	Olifants	В3	Central Highlands	Mixed Bushveld	VMrl	P
Mogohu	Olifants	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	Vru, Vp	N
Mogoto	Nkumpi	B5	Bushveld Basin, Central Highlands	Clay Thorn Bushveld, North-Eastern Mountain Grassland	Jl, Vgwb, Vm	N
Mohlabesi	Olifants	В7	Lowveld	Mixed Lowveld Bushveld	Z	N
Mohlakeng	Ngwaritsi	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Mohlakolane	Ngwaritsi	B5	Bushveld Basin	Mixed Bushveld	Vru, VMrl	P
Mohlalaotwane	Olifants	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	VMrl	P
Mohlaletsi	Olifants	B5	Bushveld Basin	Mixed Bushveld	Vru	P
Mohlapitse	Olifants	В7	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vp, Vgwb, Vm	P
Mohlomobe	Mutlumuvi	Х3	Great Escarpment Mountains, Lowveld	Afromontane Forest, Sour Lowveld Bushveld	Z, R	P
Mokgorwane	Moopetsi	B4	Central Highlands	Mixed Bushveld	Vp, Vru	N
Molapakgomo	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z, R	N
Molapong	Ohrigstad	B6	Central Highlands	North-Eastern Mountain Grassland	Vm, Vp	N
Molawetse	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld	Vru	N
Molempse	Ivulati	B7	Lowveld	Mopane Bushveld	Z, Zg, Rro	N
Molototsi	Groot Letaba	В8	Lowveld	Sour Lowveld Bushveld, Mixed Lowveld Bushveld, Mopane Bushveld	Z, Zgi, V	P
Monwana	Klaserie	В7	Lowveld	Mixed Lowveld Bushveld	Z	N
Moopetsi	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld	Vp, Vru	P
Moopetsi	Motse	В7	Central Highlands	Mixed Bushveld	Vru	P
Morola	Makhutswi	В7	Great Escarpment Mountains, Lowveld	Afromontane Forest, Mixed Lowveld Bushveld, North- Eastern Mountain Grassland, Sour Lowveld Bushveld	Vgwb, Z	N
Morotong	Mohlaletsi	B5	Bushveld Basin	Mixed Bushveld	Vru	N
Morudi	Groot Letaba	В8	Lowveld	Sour Lowveld Bushveld	V	N
Morwanalane	Ngwaritsi	B5	Bushveld Basin	Mixed Bushveld	VMrl	N
Mosehla	Mativuhlungu	X3	Lowveld	Mixed Lowveld Bushveld, Sweet Lowveld Bushveld	Z, Jl, PTRu	N
Moseleng	Motse	В7	Central Highlands	Mixed Bushveld	Vp	N
Moses	Elands	В3	Bushveld Basin, Central Highlands, Highveld	Mixed Bushveld, Rocky Highveld Grasslands	VMrl, Vro, Vt, Vg	P
Mosohlotse	Steelpoortrivier	B4	Bushveld Basin, Central Highlands	Mixed Bushveld	Vru	N
Mosokuditsi	Tlhabasane	B5	Central Highlands	North-Eastern Mountain Grassland	RV, Vgwb	N

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Mosomeeste	Ga-Matombane	В7	Lowveld	Mixed Lowveld Bushveld	R	N
Mosukodutsi	Middel Letaba	B8	Lowveld	Sour Lowveld Bushveld, Mixed Lowveld Bushveld	Z	P
Motlasedi	Klaserie	В7	Great Escarpment Mountains, Lowveld	Afromontane Forest, Sour Lowveld Bushveld, Mixed Lowveld Bushveld	Z	N
Motse	Olifants	В7	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vp, Vru	P
Motsekgano	Olifants	В5	Bushveld Basin	Mixed Bushveld	VMrl	P
Motseleope	Olifants	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Motsemohlaba	Olifants	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Motsephiri	Olifants	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	VMrl	P
Motsitsi	Marite	X3	Lowveld	Sour Lowveld Bushveld	Z	P
Moungwana	Makhutswi	В7	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Z, Vgwb	N
Mpanamana	Crocodile	X2	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jl, Jj	N
Mpandeni	Vurhami	X2	Lowveld	Sweet Lowveld Bushveld	Jl	N
Mpfuvu	Olifants	В7	Lowveld	Mopane Bushveld, Sweet Lowveld Bushveld	Z, Jl, PTRu	N
Mphake	Motsemohlaba	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Mphofu	Komati	X1	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld		P
Mphogodiba	Olifants	B5	Central Highlands, Limpopo Plain	North-Eastern Mountain Grassland	RV, Z	P
Mphongolo	Shingwidzi	В9	Central Highlands, Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld, Mopane Shrubveld	Ms, Z, Jl	N
Mphuphule	Nwanedzi	В8	Lowveld	Sour Lowveld Bushveld, Mixed Lowveld Bushveld	V	N
Mshobeni	Sand	X3	Lowveld	Mixed Lowveld Bushveld	R	N
Msimuku	Nwaswitshaka	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Msuthulu	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z, R	N
Mthimsila	Tsiri	В7	Lowveld	Mopane Bushveld	Z	N
Mtlhowa	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Mtshawu	Sabie	X3	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N
Mtsoli	Komati	X1	Great Escarpment Mountains	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Zba	P
Mude	Ngwabitsi	В7	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Vgwb, Z	N
Mulalani	Olifants	В7	Lowveld	Mopane Bushveld	Z	N
Mulati	Ivulati	В7	Lowveld	Mopane Bushveld, Sour Lowveld Bushveld	Zg, Rro	P
Musutlu	Msuthulu	X3	Lowveld	Mixed Lowveld Bushveld	R	N
Mutlumuvi	Sand	X3	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	R	P
Mutlumuvi (east)	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Mzimnene	Komati	X1	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld		P

River Name	Tributary of	2 ^O Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Mzinti	Komati	X1	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	R	P
Nalatsi	Klein Letaba	B8	Lowveld	Mopane Bushveld	Z	P
Napi	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Ndivanini	Nhlorolumi	В7	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z	N
Ndubazi	Komati	X1	Great Escarpment Mountains, Highveld	North-Eastern Mountain Grassland	Vp	P
Nelspruit	Crocodile	X2	Great Escarpment Mountains, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vm, Vp, Z	P
Newu	Mlambeni	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Ngodwane	Elands	X2	Great Escarpment Mountains	Afromontane Forest, Sour Lowveld Bushveld	Vm, Z	P
Ngotso	Olifants	B7	Lowveld	Sweet Lowveld Bushveld	Jl	P
Ngwabitsi	Ga-Selati	В7	Great Escarpment Mountains, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld, Mixed Lowveld Bushveld	Vgwb, Z	N
Ngwamutsatsa	Timbavati	B7	Lowveld	Mixed Lowveld Bushveld, Sweet Lowveld Bushveld	Z	N
Ngwaritsi	Olifants	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Ngwemyameni	Sabie	X3	Lowveld	Sour Lowveld Bushveld	Z	P
Ngwenyeni	Letaba	В8	Lowveld	Mopane Bushveld, Mopane Shrubveld	Z	N
Ngwenyeni	Komati	X1	Lebombo Uplands	Sweet Lowveld Bushveld, Lebombo Arid Mountain Bushveld	Jl	N
Ngweti	Komati	X1	Great Escarpment Mountains, Lowveld, Lebombo Uplands	Mixed Lowveld Bushveld, Sweet Lowveld Bushveld, Lebombo Arid Mountain Bushveld	Zba, Jl, R, PTRu	N
Nhawavi	Sabie	X3	Lebombo Uplands, Lowveld	Sweet Lowveld Bushveld	Jl	N
Nhiarhweni	Letaba	B8	Lowveld	Mopane Bushveld	Z, Zg, RV	N
Nhlanganeni	Nwaswitshaka	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Nhlaralumi	Olifants	В7	Lowveld	Mopane Bushveld, Sweet Lowveld Bushveld	Z	P
Nhlowa	Sabie	Х3	Lebombo Uplands	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl	N
Nkawu	Mlambeni	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Nkulumbeni	Mphongolo	В9	Lowveld	Mopane Bushveld, Mopane Shrubveld	Jl	N
Nkumpi	Olifants	В5	Bushveld Basin, Central Highlands, Limpopo Plain	Clay Thorn Bushveld, Mixed Bushveld, North-Eastern Mountain Grassland	Vgwb, PTRu, Jl, VMrl, V, RV	N
Noordkaap	Kaap	X2	Great Escarpment Mountains, Lowveld	Afromontane Forest, Sour Lowveld Bushveld	Z, Zba	P
Noord-Sandrivier	Sabie	X3	Lowveld	Sour Lowveld Bushveld	Z	P
Nsama	Klein Letaba	B8	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z, Zgi	N
Nsikazi	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z, Zba	P
Ntlokeweni	Nsikazi	X2	Lowveld	Sour Lowveld Bushveld	Z	N
Nungwini	Dzundzulukweni	X4	Lebombo Uplands, Lowveld	Sweet Lowveld Bushveld	Jl	N
Nwandlamuhari	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z	P

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Nwanedzi	Groot Letaba	B8	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z, V	P
Nwanedzi	Letaba	В8	Lowveld	Mopane Bushveld, Mopane Shrubveld	Z, Jl	P
Nwanedzi	Shishangale	X4	Lebombo Uplands, Lowveld	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl, Jj, PTRu, Z	Р
Nwarhete	Xixamba	X3	Lowveld	Sour Lowveld Bushveld	R	P
Nwaritsana	Marite	Х3	Great Escarpment Mountains, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vgwb, Z, R	N
Nwaswitsantso	Unspecified	X4	Lebombo Uplands, Lowveld	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld, Mixed Lowveld Bushveld	Jl, Jj, PTRu, Z	N
Nwaswitshaka	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Nwatimhiri	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Nwatindlopfu	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Nwatindloptu	Nwatindlopfu	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Nwatinwambu (east)	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Nwatinwambu (west)	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Nwayimeni	Olifants	В7	Lowveld	Mopane Bushveld	Z	N
Nyameni	Nhlaralumi	В7	Lowveld	Mopane Bushveld	Z	N
Nyamondwa	Mtshawu	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Nyanga	Nsikazi	X2	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N
Nyangane	Hlangeni	В7	Lowveld	Sweet Lowveld Bushveld	Jl	N
Nyonyane	Komati	X1	Highveld, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld		P
Ohrigstad	Blyde	В6	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vm, Vp, Vgwb	P
Olifants B1, B3, B5, B7, B8		Central Highlands, Bushveld Basin, Great Escarpment Mountains, Lowveld, Lebombo Uplands	Eastern Mountain Grassland, Mixed Bushveld, Mixed Lowveld Bushveld, Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld, Mopane Bushveld, Mopane Shrubveld	Pe, Vro, Vp, Vru, Vm, VMlw, Vgwb, VMrl, Vt, Jj, Jl, Z, Zg, R, PTRu	P	
Osspruit	Bronkhorstspruit	B2	Central Highlands, Highveld	Moist Cool Highveld Grasslands	Vp	P
Palmloop	Olifants	В7	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z	N
Pelangwe	Olifants	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	Vru	N
Phabeni	Sabie	X3	Lowveld	Sour Lowveld Bushveld	Z	P
Phasaphasa	unspecified	X3	Lowveld	Sour Lowveld Bushveld	Z	P
Phelwana	Timbavati	B7	Lowveld	Sweet Lowveld Bushveld	Z	N
Phiring	Ohrigstad	В6	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland	Vgwb, Vm	N
Phophonyane	Mlumati	X1	Great Escarpment Mountains, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld		P

River Name	Tributary of	2 ^o Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Phungwe	Manyeleti	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Piekespruit	Debeerspruit	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Politsi	Groot Letaba	В8	Central Highlands, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	V	P
Poponyane	Gladdespruit	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Z, Zba	P
Potloodspruit	Dorpsrivier	B4	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Pshirwa	Sebilwane	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	Vru	N
Puleng	Olifants	B5	Bushveld Basin, Central Highlands	Mixed Bushveld	VMrl	P
Queen's	SuidKaap	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Zba	P
Ramogwerane	Puleng	B5	Bushveld Basin	Mixed Bushveld	VMrl	P
Ramspruit	Ga-Selati	B7	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z, R	N
Randspruit	Vurhami	X2	Lowveld	Mixed Lowveld Bushveld	PTRu, Z	N
Rapholo	Olifants	B5	Central Highlands	Mixed Bushveld	Vru	P
Red Gorlon	Chalons	B7	Lowveld	Mopane Bushveld, Sweet Lowveld Bushveld	Z	N
Renosterspruit	Rietspruit	X2	Lowveld	Sour Lowveld Bushveld	Z	N
Revolver Creek	Shiyalongubo	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Z, Zba	P
Rietbokloop	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Rietfonteinspruit	Alexanderspruit	X2	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Rietspruit	Steenkoolspruit	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Rietspruit	Sandspruit	В6	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N
Rietspruit	Ga-Selati	B7	Lowveld	Mopane Bushveld	Z, Zg, R	N
Rietspruit	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Rietspruit	Elands	X2	Great Escarpment Mountains	Sour Lowveld Bushveld	Vp	P
Rietspruit	Noordkaap	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Rietvlei	Queen's	X2	Great Escarpment Mountains	Sour Lowveld Bushveld	Z, Zba	P
Rietvleispruit	Elands	X2	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp	P
Rigudzwe	Ngwabitsi	B7	Lowveld	Sour Lowveld Bushveld	Z, Zg	N
Ripape	Nwaswitsantso	X4	Lowveld	Sweet Lowveld Bushveld, Mixed Lowveld Bushveld	PTRu, Z	N
Rooipoortspruit	Moses	В3	Bushveld Basin, Highveld	Mixed Bushveld, Rocky Highveld Grasslands	VMrl, Vro	N
Rooisloot	Kameel	В3	Central Highlands	Mixed Bushveld	VMrl	P
Saaiwaterspruit	Tweefonteinspruit	B1	Highveld	Moist Sandy Highveld Grasslands	Pe	P
Saalboomspruit	Kromdraaispruit	B2	Central Highlands	Rocky Highveld Grasslands, Moist Cool Highveld	VMlw, Pe	P

River Name	Tributary of	2 ^o Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
				Grasslands, Moist Sandy Highveld Grasslands		
Sabane	Sabie	X3	Lowveld	Sour Lowveld Bushveld	Z	P
Sabie		Х3	Great Escarpment Mountains, Lebombo Uplands, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld, Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Vm, Vp, Jl, Jj, Z, R, PTRu	P
Salitje	Sabie	X3	Lebombo Uplands, Lowveld	Sweet Lowveld Bushveld	Jl, PTRu, Z	N
Salt Creek	Crocodile	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Zba	P
Salubivide	Nsikazi	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Samarhole	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Sand	Sabie	Х3	Great Escarpment Mountains, Lowveld	Afromontane Forest, Sour Lowveld Bushveld, Mixed Lowveld Bushveld	Z, R	P
Sandrivier	Sandspruit	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Z	N
Sandspruit	Kameel	В3	Central Highlands	Mixed Bushveld	VMrl	P
Sandspruit	Blyde	В6	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	P
Sandspruit	Timbavati	В7	Lowveld	Sweet Lowveld Bushveld	Jl, PTRu, Z	N
Sandspruit	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland	Zba, Z, R	P
Sandspruit	Nelspruit	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Sandspruit	SuidKaap	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Saringwa	Sabie	X3	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	R	P
Sebilwane	Lepellane	B5	Bushveld Basin	Mixed Bushveld	Vru	P
Sebitsa	Kuanyane	В7	Great Escarpment Mountains	Mixed Lowveld Bushveld	R	N
Sebitsa	Motse	В7	Central Highlands	Mixed Bushveld	Vp, Vru	N
Sedumoni	Olifants	В7	Lowveld	Mixed Lowveld Bushveld	Z, R, Zg	N
Seekoeispruit	Komati	X1	Great Escarpment Mountains, Highveld	North-Eastern Mountain Grassland	Zba, Z, Vm, Vp	P
Sekgwe	Tebeng	B7	Lowveld	Mopane Bushveld	Z, R, Zg	N
Selons	Olifants	В3	Central Highlands, Highveld	Mixed Bushveld, Moist Sandy Highveld Grasslands, Rocky Highveld Grasslands	Vru, Vro, VMlw, Pe	P
Sephiriri	Sand	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Sesete	Timbavati	В7	Lowveld	Mixed Lowveld Bushveld	Z	P
Setshitwe	Ga-Selati	В7	Lowveld	Mopane Bushveld	Z	N
Shabene	Olifants	В7	Lowveld	Mixed Lowveld Bushveld	Z, R, Zg	N
Shakwaneng	Steelpoortrivier	B4	Bushveld Basin, Central Highlands	Mixed Bushveld	Vru	N
Shamiriri	Olifants	B7	Lowveld	Mopane Shrubveld	Jl	N
Sheshanyana	Mphongolo	B9	Lowveld	Mopane Bushveld, Mopane Shrubveld	Jl, Z	N

River Name	Tributary of	2° Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Sheshanyana	Phugwane	B9	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z	N
Shimangwana	Nhlowa	Х3	Lebombo Uplands, Lowveld	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl, Jj	N
Shingwidzi		В9	Lowveld	Mopane Bushveld, Mopane Shrubveld, Lebombo Arid Mountain Bushveld, Mixed Lowveld Bushveld	Jl, Z, Zgi	P
Shinkelegane	Nwanedzi	X4	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jl, Jj	N
Shinkwene	Mnondozi	X3	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jj	N
Shipikani	Letaba	B8	Lowveld	Mopane Bushveld, Mopane Shrubveld	Z	N
Shisakashanghondo	Timbavati	B7	Lowveld	Mopane Bushveld, Sweet Lowveld Bushveld	Z, Jl, PTRu	P
Shisha	Mphongolo	B9	Lowveld	Mopane Bushveld	Jl, PTRu, Ms, Z	P
Shishangale		X4	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jj	P
Shitlhave	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Shiyalongubo	Kaap	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Z, Zba	P
Siphampanane	Mbyamiti	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Sithungwane	Fayi	X2	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z	N
Skilferlaagtespruit	Steelpoortrivier	B4	Highveld	Moist Sandy Highveld Grasslands	Vru	N
Skoonspruit	Elands	X2	Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp	P
Snuifspruit	Sand	X3	Lowveld	Mixed Lowveld Bushveld	R	P
Soeketse	Klein Letaba	В8	Lowveld	Sour Lowveld Bushveld	Z	N
Spanplekspruit	Sabie	X3	Lowveld	Mixed Lowveld Bushveld	Z	N
Spekboomrivier	Steelpoortrivier	B4	Central Highlands, Great Escarpment Mountains	Mixed Bushveld, North-Eastern Mountain Grassland	Vp	P
Spitskopspruit	Sabie	Х3	Great Escarpment Mountains, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vm, Z	N
Spruit	Dorpsrivier	B4	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Statsrivier	Crocodile	X2	Great Escarpment Mountains, Lowveld	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vm, Z, Vp	P
Steelpoortrivier	Olifants	B4	Central Highlands, Great Escarpment Mountains, Highveld	Mixed Bushveld, Moist Sandy Highveld Grasslands, North- Eastern Mountain Grassland	Vp, Vru, Vm, Pe	P
Steenkoolspruit	Olifants	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Steenkoolspruit	Wilge	B2	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Sterkfonteinspruit	Wilge	B2	Central Highlands	Rocky Highveld Grasslands	VMlw, CPd	P
Sterkloop	Crocodile	X2	Central Highlands, Great Escarpment Mountains	Sour Lowveld Bushveld, North-Eastern Mountain Grassland	Vp	P
Sterkspruit	Dorpsrivier	B4	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Sterkspruit	Crocodile	X2	Central Highlands, Great Escarpment Mountains	Afromontane Forest, Sour Lowveld Bushveld	Vp	P
Stolznekspruit	Mlambeni	X2	Lowveld	Mixed Lowveld Bushveld	Z	N
Stretters Creek	Mhlalathi	X2	Great Escarpment Mountains, Lowveld	Mixed Lowveld Bushveld	R	N
SuidKaap	Kaap	X2	Great Escarpment Mountains	Sour Lowveld Bushveld	Z, Zba	P
Swartkoppiesspruit	Elands	X2	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp	P
Swartspruit	Olifants	B7	Lowveld	Mixed Lowveld Bushveld	Z, R	N
Swartspruit	Komati	X1	Great Escarpment Mountains, Highveld	North-Eastern Mountain Grassland, Moist Sandy Highveld Grasslands	Vp, Pe	P
Sweni	Makongolweni	X4	Lebombo Uplands, Lowveld	Lebombo Arid Mountain Bushveld, Sweet Lowveld Bushveld	Jl, PTRu, Z	N
Taalfonteinspruit	Grootspruit	B2	Highveld	Rocky Highveld Grasslands	CPd	N
Tautesloop	Elands	X2	Central Highlands	North-Eastern Mountain Grassland	Vp	P
Tebeng	Ga-Selati	B7	Lowveld	Mopane Bushveld	Z, Zg	N
Teespruit	Komati	X1	Great Escarpment Mountains, Highveld	North-Eastern Mountain Grassland	Zba, Z, R, Pe	N
Thabina	Leisitel	В8	Great Escarpment Mountains, Central Highlands, Lowveld	Afromontane Forest, North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vgwb, Zg, Rro, Z	N
Tholong	Motsemohlaba	B5	Bushveld Basin	Mixed Bushveld	VMrl	N
Thulandziteka	Sand	X3	Lowveld	Sour Lowveld Bushveld	Z, R	N
Timbavati	Olifants	B7	Lowveld	Mixed Lowveld Bushveld, Sweet Lowveld Bushveld	Z, Jl, PTRu	P
Timfeneni	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld, Sour Lowveld Bushveld	Z, Zba	N
Tipperary Spruit	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Tlhabasane	Olifants	В5	Central Highlands, Limpopo Plain	Mixed Bushveld, North-Eastern Mountain Grassland	Vp, Vru, Z, Vgwb, Vm, Rv	N
Tlharilome	Nhlaralumi	В7	Lowveld	Mixed Lowveld Bushveld, Mopane Bushveld	Z	P
Tondeldoosloop	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vru, Vp	P
Tongwane	Olifants	В7	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vp, Vgwb, Vm	N
Tretkuilspruit	Klein-Olifants	B1	Highveld	Moist Sandy Highveld Grasslands	Pe	P
Treu	Blyde	B6	Great Escarpment Mountains	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vgwb	P
Trichardsfonteindam	Trichardspruit	B1	Highveld	Moist Clay Highveld Grasslands	Pe	P
Trichardspruit	Vaalbankspruit	B1	Highveld	Moist Clay Highveld Grasslands	Pe	P
Tsende	Letaba	B8	Lowveld	Mopane Bushveld, Mopane Shrubveld	Jl, Z	P
Tshutshi	Mulalani	В7	Lowveld	Mopane Bushveld	Z	N
Tshwenyane	Moopetsi	B7	Central Highlands	Mixed Bushveld	Vru	P
Tsiri	Olifants	B7	Lowveld	Mopane Bushveld	Z	N
Tsolameeste	Makhutswi	B7	Great Escarpment Mountains,	Mixed Lowveld Bushveld, North-Eastern Mountain	Z, Vgwb, Zg	N

River Name	Tributary of	2 ^o Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
			Lowveld	Grassland, Sour Lowveld Bushveld		
Tswenyane	Olifants	В7	Central Highlands, Great Escarpment Mountains	North-Eastern Mountain Grassland	Vgwb, Vm	N
Tweefonteinspruit	Olifants	B1	Highveld	Moist Sandy Highveld Grasslands	Pe	P
Ubatsane	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld	Vru	N
Ugutugulo	Mlumati	X1	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Zba	P
Ulundi Creek	unspecified	X2	Great Escarpment Mountains	Sour Lowveld Bushveld	Zba	N
Umhlatana	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland		N
Vaalbankspruit	Steenkoolspruit	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Vaalrivierspruit	Komati	X1	Great Escarpment Mountains, Highveld	North-Eastern Mountain Grassland, Moist Sandy Highveld Grasslands	Vp, Pe	P
Valsspruit	Taalfonteinspruit	B2	Highveld	Rocky Highveld Grasslands	CPd	N
Vandykspruit	Hartebeespruit	В3	Bushveld Basin	Mixed Bushveld	VMrl, VMlw	P
Viskuile	Olifants	B1	Highveld	Moist Clay Highveld Grasslands, Moist Sandy Highveld Grasslands	Pe	P
Visspruit	Crocodile	X2	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Z	P
Vulwamati	Sabie	X3	Lowveld	Mixed Lowveld Bushveld, Sweet Lowveld Bushveld	Z	N
Vurhami	Crocodile	X2	Lowveld	Mixed Lowveld Bushveld, Sweet Lowveld Bushveld	PTRu, Z, Jl	N
Vyehoek	Kgwete	B6	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Waaikraalloop	Komati	X1	Great Escarpment Mountains	North-Eastern Mountain Grassland	Vp	P
Watervalloop	Olifants	В3	Central Highlands	Mixed Bushveld, Rocky Highveld Grasslands	Vro, VMlw	P
Watervalrivier	Spekboomrivier	B4	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vp	P
Weltevredespruit	Elands	X2	Great Escarpment Mountains	Sour Lowveld Bushveld	Vp	N
White Waters	Noord-Sandrivier	X3	Lowveld	Sour Lowveld Bushveld	Z	N
Wilge	Olifants	B2	Central Highlands, Highveld	Mixed Bushveld, Rocky Highveld Grasslands, Moist Clay Highveld Grasslands, Moist Cool Highveld Grasslands, Moist Sandy Highveld Grasslands	Vro, VMlw, Pe, Vp	P
Wilgekraalspruit	Crocodile	X2	Central Highlands	North-Eastern Mountain Grassland, Sour Lowveld Bushveld	Vp	P
Witkloofspruit	Komati	X1	Great Escarpment Mountains, Highveld	North-Eastern Mountain Grassland, Moist Sandy Highveld Grasslands	Vp, Pe	P
Witpoortrivier	Steelpoortrivier	B4	Central Highlands	Mixed Bushveld, North-Eastern Mountain Grassland	Vp, Vru	P
Witrivier	Crocodile	X2	Lowveld	Sour Lowveld Bushveld	Z	P
Witwaterspruit	White Waters	Х3	Great Escarpment Mountains, Lowveld	Sour Lowveld Bushveld	Z	P
Woes-Alleenspruit	Klein-Olifants	B1	Highveld	Moist Sandy Highveld Grasslands	Vro, Pe	P
Xiharini	Mnondozi	X3	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jį	N

River Name	Tributary of	2 ⁰ Catchment	Ecoregion Level 1	Vegetation Types	Lithostratigraphic Units	Hyd Type
Xiwondsweni	Sabie	X3	Lebombo Uplands	Lebombo Arid Mountain Bushveld	Jj	N
Xixamba	Mutlumuvi	X3	Lowveld	Sour Lowveld Bushveld	R	P
Xiyanamane	Nhlaralumi	В7	Lowveld	Mopane Bushveld	Z	N

2. Conclusions

One of the aims of this report was to outline developments with respect to the establishment of a spatial framework which would facilitate the selection of reference sites for use in the derivation of ecological reference conditions for rivers of Mpumalanga.

The three-tiered hierarchical approach adopted in this project has enabled the rivers of the Mpumalanga region to be grouped in one of seven identified ecoregions. Verification of these ecoregions will need to be undertaken once more detailed information has been collected, and will most likely be an iterative process, with ecoregions becoming more refined over time. This is, however, outside the scope of the current project, although information collected during this project will contribute to verification of the ecoregions.

Geomorphological zonation or sub-regional division of the main rivers and selected tributaries has enabled the identification of the zones present in each of these ecoregions. The analysis has also provided an indication as to the proportional representation of each zone within each ecoregion. Extrapolation from zoned rivers to ones for which geomorphological zonation is not yet known may be possible using the terrain morphology cover of the ENPAT97 series (Van Riet *et al.* 1997). This has not been done at this stage as it was beyond the scope of the report. However, complications are likely to arise where smaller rivers are concerned. Geomorphological zonation of rivers based on gradient calculated from digitised 1:250 000 covers is extremely time consuming and the potential to use an alternative method such as the digital terrain models for river zonation should be investigated.

As mentioned previously, identification of river types *a priori* proved to be problematic. The type of information needed for this level of the hierarchy, such as river size, geomorphological and biological characteristics, is best collected in the field. It is therefore suggested that river types be identified as part of subsequent ground-truthing or field verification phases. Components incorporated in the ecoregions such as terrain morphology, vegetation and geology may also prove useful contributors to the identification of river types.

The graphical information presented in this report related to ecoregions, geomorphological zones, terrain morphology, vegetation and geology for each secondary catchment has facilitated initial characterisation of each river with respect to these factors. The summary table of all named rivers at 1:250 000 or 1:500 000 scale (Table 4) provides details related to each river's "parent" river, ecoregion level 1, vegetation type, geological or lithostratigraphic type and hydrological type. Future selection of reference sites should be undertaken within these initial spatial components using hierarchical levels 1 and 2, together with level 3 river types identified during the ground-truthing phase.

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Appendix 1. Potential natural vegetation of South Africa, Lesotho and Swaziland (Low and Rebelo 1996).

Biome	Type Name	
Forest	Afromontane Forest	
	Moist Clay Highveld Grasslands	
Cusseland	Moist Sandy Highveld Grasslands	
Grassland	North-Eastern Mountain Grasslands	
	Rocky Highveld Grasslands	
	Clay Thorn Bushveld	
	Lebombo Arid Mountain Bushveld	
	Mixed Bushveld	
Conseque	Mixed Lowveld Bushveld	
Savanna	Mopane Bushveld	
	Mopane Shrubveld	
	Sour Lowveld Bushveld	
	Sweet Lowveld Bushveld	

Appendix 2. Lithostratigraphic units specified in the geology map of South Africa with simplified lithostratigraphy for geohydrological use (Vegter 1995). Lithostratigraphy is the description of the strata- sedimentary, igneous and metamorphic-in terms of mineralogic composition. It reflects the mineral composition of the associated water.

Lithostrati- graphic Symbol	Degree Of Metamorphism	Deformation	Lithostratigraphic Units	Principal Rock Types
CPd	0-1	U	Dwyka Formation	Tillite with subordinate sandstone, mudstone, shale; intruded by dolerite dykes and sheets
Jj	0	U	Jozini Formation, Tshokwane Granophyre, Bumeni Complex:	Rhyolite, granophyre, syenite, tuff, breccia, minor sedimentary rocks
Л	0	U	Letaba Formation:	Basalt; north-south trending dolerite dykes along Lebombo range
Kma	0	U	Malvernia Formation:	Sandstone, conalomerate, marl
Ms	1	U	Soutpansberg Group and Blouberg Formation:	Quartizite, conglomerate, grit, sandstone, siltstone, mudstone, shale, basalt, trachy-andesite, tuff; diabase dykes/sills
Pe	0	U	Ecca Group:	Shale; intruded by dolerite dykes and sheets
PTru	0	U	Undifferentiated Karoo Sequence:	Sandstone, siltstone, mudstone, shale; intruded by dolorite and includes patches of Letaba basalt north of the Soutpansberg
R	2-4	U-D	Houtrivier, Salisbury Kop, Mpuluzi, Gaborone, Harmony and Cunning Moor Intrusives:	Biotite-muscovite granite, gneiss, leucogranite, migmatite, potassic granite, quartz monzonite, tonalite, quartz porphyry
Rro	1	D	Rooiwater Complex:	Diorite, gabbro
RV	2	U	Mashashane and Mashishimale Suites; Aderouke, Hugomond, Lekkersmaak, Mtlala, Matok, Moletsi, Palmietfontein, Shamiriri, Shirindi, Smitskraal, Turfloop, Utrecht, Mosita And Unnamed Intrusives:	Granite, biotie-muscovite granite; diabase/dolerite dykes
V	2	U	Mpageni, Meinhardskraal and Unnamed Intrusives:	Potassic biotite and leucocratic granites with north- easterly trending diabase / dolerite dykes
Vg	2-3	D	Groblersdal Group: Dennilton and	Lava, tuff, schist, gneiss, slate, shale, quartzite

Lithostrati- graphic Symbol	Degree Of Metamorphism	Deformation	Lithostratigraphic Units	Principal Rock Types
			Bloempoort Formations:	
Vgwb	2	U-D	Godwan Formation, Wolkeberg Group and Black Reef Formation:	(except where the latter is included with Malmani subgroup and Assen formation): Lava, tuff, quartzite, shale, conglomerate
Vm	0-2	U-D	Malmani Subgroup, Assen and Black Reef Formations:	(exept where the latter is included with Godwan formation and Wolkberg group): Dolomite, chert, subordinate quartzite, conglomerate, shale; diabase and syenite dykes and sills
VMlw	1	U	Loskop and Wilge River Formations:	Pyroclastics, lava, quartzite,conglomerate, sandstone siltstone; grit, shale, diabase sills
VMrl	0	U	Rashoop Granophyre and Lebowa Granite Suite:	Granophyre, hornblende and biotite granites
Vp	0-3	U-D	Pretoria Group, Duitschland, Penge and Langrant Formations:	Quartzite, shale, conglomerate, iron formation, breccia, diamicitite, limestone, dolomite, and where not shown separately as Vh, andesite; also includes Malmani dolomite north of Vredefort dome; diabase sills, syenite and diabase dykes
Vro	0-1	U-D	Rooiberg Group:	Rhyolite, pyroclastics
Vru	1	U	Rustenburg Layered Suite:	Bronzitite, harzitite, harzhurgite, norite, pyroxenite, anorthotise, gabbro, diorite
Vrw	0	U	Rust Der Winter Formation:	Sandstone, conglomerate, rhyolite
Vt	2	D	Pretoria And Chuniespoort Groups:	Quartzite, shale, dolomite
Z	2-4	U-D	Nelspruit, Dalmein, Hebron, Halfway House, Goudplaats and Unnamed Intrusives:	Granite, granodiorite, tonalite, gneiss, migmatite
Zba	1-2	D	Barberton Sequence:	Sandstone, shale, conglomerate, greywacke, lava, pyroclastic rocks
Zg	2	D	Gravelotte Group:	Ultramafic, mafic and acid lava, tuff, schist, conglomerate, quartzite
Zgi	2-3	D	Giyani Group:	Ultramafic and mafic lavas, schist
Zp	3	D	Pietersburg Group:	Ultramafic and mafic lavas, quartzite, conglomerate, chloriteschist

Lithographic symbols: Capital letter (or letters) denote:

- (a) Systems: Quaternary, Tertiary, (K) Cretaceous, Jurassic, (Tr) Triassic, Permian, Carboniferous, Devonian, Ordovician, Silurian, (E) Cambrian.
- (b) Erathems: Namibian, Mokolian, Vaalian, Randian, (Z) Swazian.

Degree of metamorphism:

- 0 Unmetamorphosed superficial deposits and platform rocks and anorogenic intrusive and extrusive rocks
- 1 Very low grade (burial, thermal, orogenic) characterised by minerals such as zeolite, prehnite, pumpellyite, riebeckite, minnesotiate, stilpnomelane
- 2 Low grade thermal (albite epidote hornfels facies) and burial/orogenic greenschist facies (epidote, chlorite, actinolite)
- 3 Medium grade thermal (hornblende hornfels) and orogenic amphibolite facies with/without migmatite
- 4 High grade thermal (pyroxene hornfels) and orogenic facies

Deformation: U – not folded or foliated; D – folded or foliated