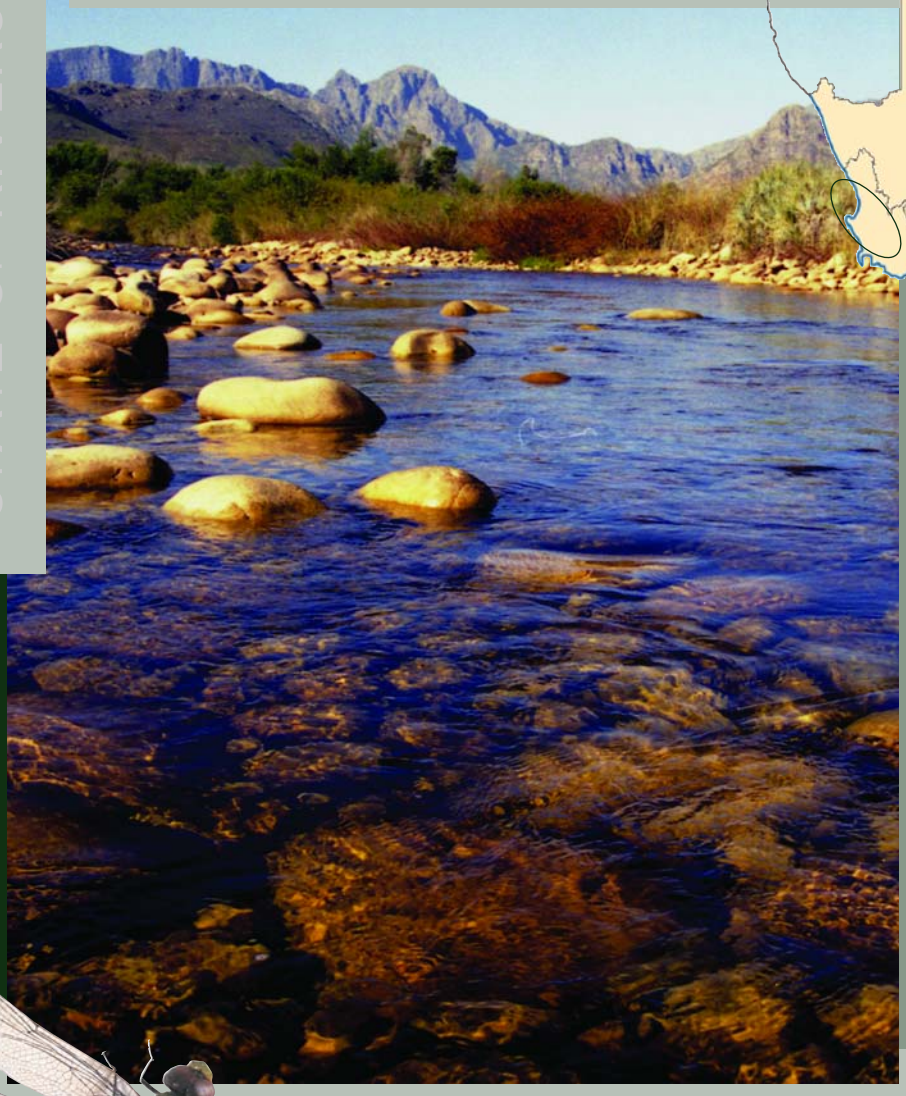
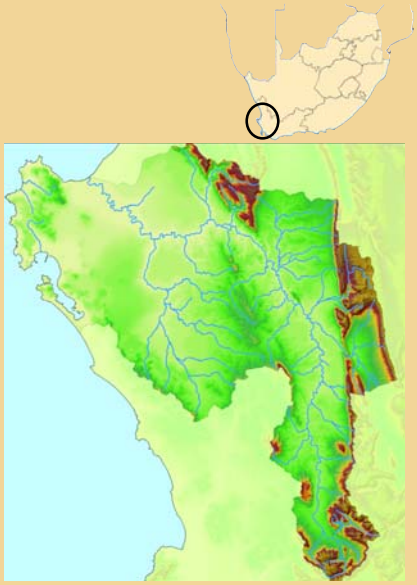
STATE-OF-RIVERS REPORT

BERG RIVER SYSTEM - 2004



RIVER HEALTH PROGRAMME



SUMMARY

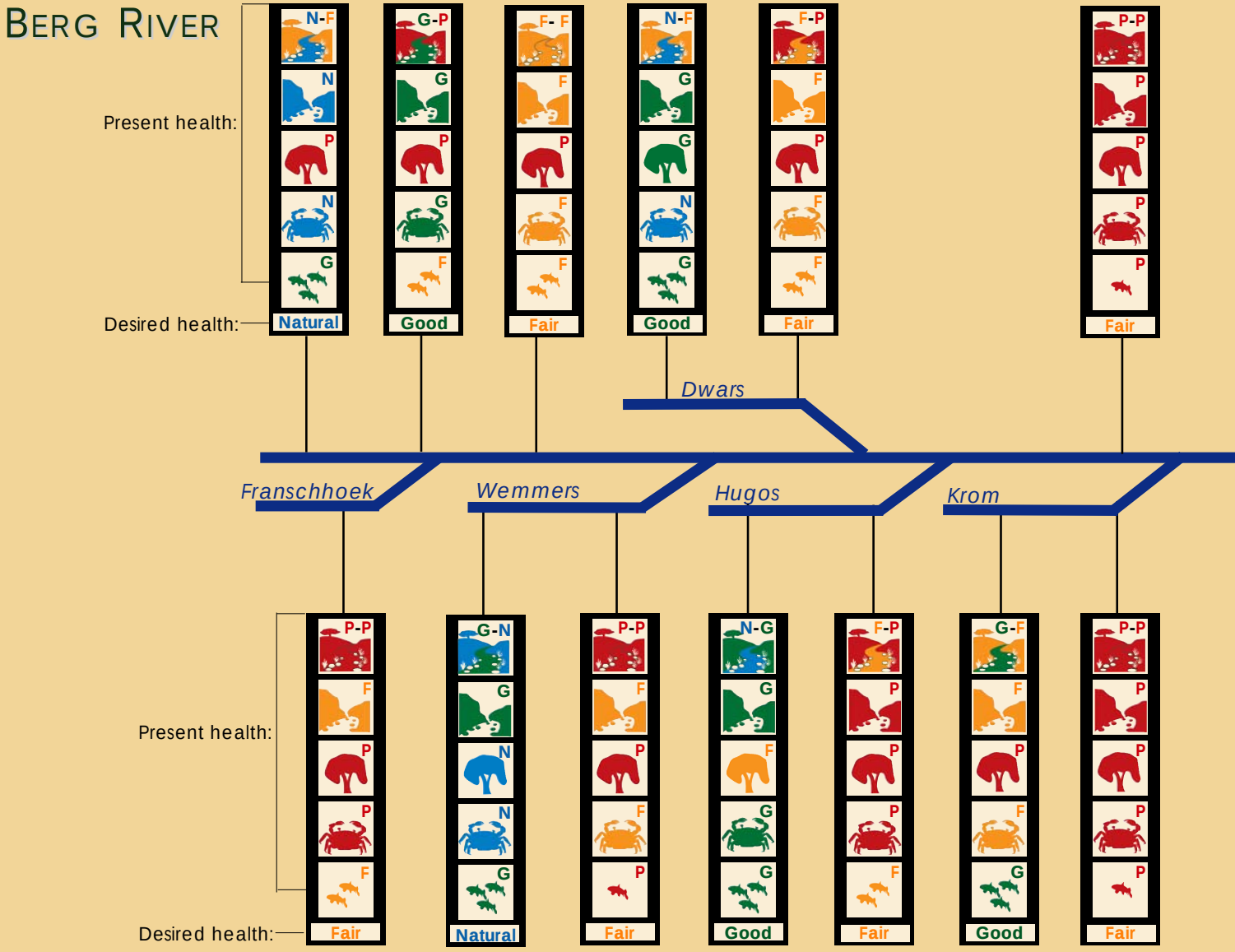
BERG RIVER SYSTEM - 2004

The Berg River rises in the Franschhoek and Drakenstein mountains. It flows northwards past Paarl, Wellington, Hermon and Gouda, where it is joined by the Klein Berg and Vier-en-Twintig rivers. The Berg River then flows westwards past Porterville, Piketberg, Hopefield and Velddrif to discharge into St. Helena Bay on the west coast.

River health Indices (p. 5):

- Index of Habitat Integrity
- Geomorphological Index
- Riparian Vegetation Index
- South African Scoring System
- Fish Assemblage Integrity Index

BERG RIVER



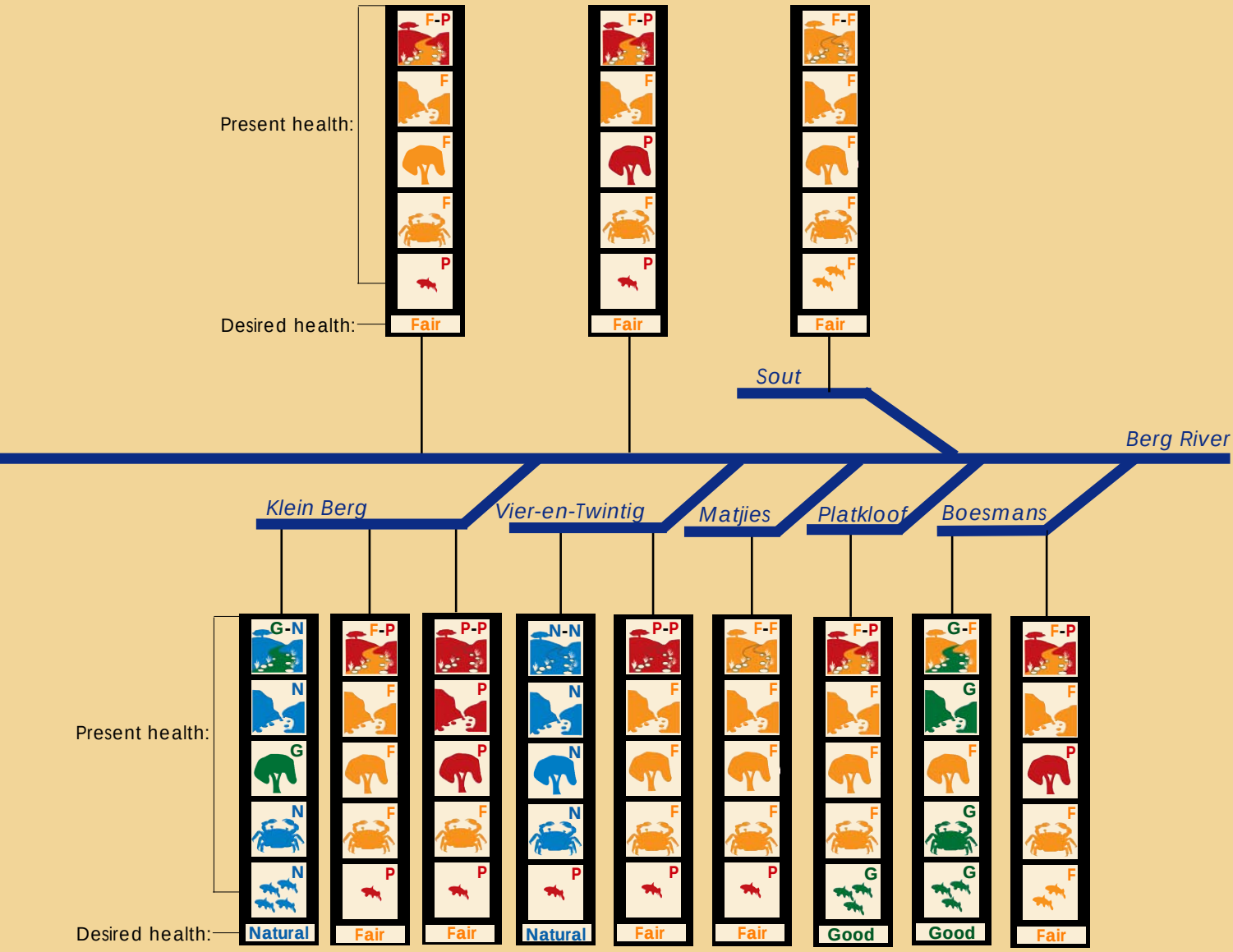
Cultivation of grapes and deciduous fruit is the backbone of the economy in the Berg River catchment. North of Wellington, dryland grain farming and sheep farming predominate. Commercial pine forests occur near the headwaters, around Franschhoek. The major industries in the Berg River basin are agriculturally based and include wineries, canneries and other food processing factories. Only the upper catchment of the Vier-en-Twintig River remains in an essentially natural state.

UPPER BERG RIVER & TRIBUTARIES Habitat integrity and water quality in the Berg River deteriorate downstream as a result of alien vegetation encroachment (*Acacia sp.*), the interbasin transfer of water and river modification. Urban and agricultural development affect the water quality at Franschhoek (municipal and wine farm effluent). The lack of environmental flow releases from Wemmershoek Dam results in a severely altered flow regime and habitat downstream.

UPPER MIDDLE BERG RIVER & TRIBUTARIES River health is reduced in the tributaries as a result of alien vegetation infestation and agricultural development (river modification, water abstraction, runoff). Water quality and habitat integrity in the Berg River and lower reaches of these tributaries are reduced due to urban development.

LOWER MIDDLE BERG RIVER & TRIBUTARIES Diversion weirs in the Klein Berg and Vier-en-Twintig rivers have altered flow patterns. Alien fish (bass and banded tilapia) are widespread and have led to the disappearance of indigenous fish (Berg River redfin and whitefish). River health is also reduced by the effects of agriculture (levees and pesticide residues). Water quality and habitat integrity near Tulbagh are poor.

LOWER BERG RIVER & TRIBUTARIES Farming practices (riparian vegetation removal, bed modification, water abstraction) and alien vegetation (black wattle, river gum) impact on the habitat integrity and flow of the rivers. Flow releases are made from the bottom of Misverstand Dam and reduce water quality. Alien fish (banded tilapia and carp) prey on or compete with indigenous fish.



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Foreword

The River Health Programme (RHP) has been in existence since in 1994. It is therefore by no coincidence that while South Africa celebrates a decade under democratic government, the RHP is also looking back at its humble beginnings. This programme was initiated out of a need to understand the status and trends of our water resources and is very much in support of our Constitution in ensuring our right to a health and safe environment. Government policy has also since 1994 focused strongly on equitable and sustainable social and economic development for the benefit of all. To achieve this, our water resources need to be monitored, assessed and reported on.

A variety of organizations, researchers and scientists have gathered the information presented in this State of Rivers Report to enable the identification of trends and emergent patterns and to assess management responses to change. The value of the report lies in the fact that it informs decision makers, interested parties and the public on fundamental issues impacting on rivers in an easy to understand format. It aims to raise awareness and understanding on the current state of our rivers, the impacts on them and what management actions can be taken by all to improve them. We are not managing rivers for the rivers sake but to ensure that future generations can continue to enjoy them.

The Berg River is an important contributor to the economic and social well-being of the greater Cape Town area. It provides water to towns, cities, rural communities, farmers and recreational users in the area. A large percentage of the country's wheat and wine farming occurs here and contributes towards the economy of the country. Tourism is a growing industry in the Western Cape, relying heavily on the goods and services that the Berg and other rivers provide. With the construction of the proposed Berg River dam soon to begin, it is important that both water resource managers and the users of the Berg River understand the current state of the river. This report, a joint initiative between the Department of Water Affairs and Forestry, the City of Cape Town, Western Cape Nature Conservation, TCTA and a number of other organizations, thus gives voice to the river and the services that it provides.

Director-General
Department of Water Affairs and Forestry

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State-of-Rivers Report: Berg River System

Contents

Context

The current state of the aquatic ecosystems presented in this report is based on the findings of river surveys that were conducted in the Berg River system as part of the River Health Programme, Western Cape. These surveys took place during 2003.

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Introduction

Water policy, legislation and management

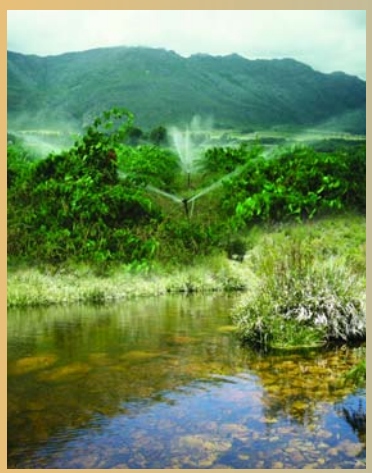
Central to South Africa's water resource management policy and legislation, is the need for equitable and efficient water use on a sustainable basis. The National Water Act (Act 36 of 1998) is the principle legal instrument for the protection, use, development, conservation, management and control of our water resources. The National Water Resources Strategy provides a long term plan of how the Act is to be implemented. To give effect to the inter-related objectives of sustainability and equity, a protective approach to water resources management has been adopted by setting objectives for the desired resource condition and limiting the impact of water use.

How do we protect our water resources?

Water resource protection is closely linked with its use. The National Water Act requires that we protect the water resources (rivers, wetlands, estuaries and aquifers) so that we can benefit from their ecosystem services, now and in the future.

Protection means to "look after and use wisely" and not to "keep separate and not use". We must use water and aquatic ecosystems for social and economic development and for poverty eradication. The amount to which that water resource is used is closely linked to the health of that ecosystem and the services that it provides. People can choose the level to which a resource is used or protected.

Globally the security, stability and environmental sustainability of all nations, particularly those in the developing world are threatened by a water crisis. This issue is highlighted in the following quotes arising from the 2nd World Water Forum in The Hague, 2000:



"Water resources, and the related ecosystems that provide and sustain them, are under threat from pollution, unsustainable use, land-use changes, climate change and many other forces. The link between these threats and poverty is clear, for it is the poor who are hit first and hardest " (Ministerial Declaration, 2nd World Water Forum).

"On the one hand, the fundamental fear of food shortages encourages ever greater use of water resources for agriculture. On the other, there is a need to divert water from irrigated food production to other uses and to protect the resource and the ecosystem. Many believe this conflict is one of the most critical problems to be tackled in the early 21st century" (Global Water Partnership).

"We need a Blue Revolution in agriculture that focuses on increasing productivity per unit of water – more crop per drop" (Secretary General Kofi Annan, United Nations)."

What goods and services do water resources provide?

All life and all sectors of the economy depend on water. We cannot live without water.

In South Africa most of our freshwater resources are obtained from rivers.

- Rivers supply water to farmers and rural communities for crops and livestock, as well as to support towns, cities, mines, industry and power generation.
- Rivers process and dilute waste.
- People need water for drinking, cooking food, washing and for health.
- Rivers supply natural products such as reeds and fish.
- Rivers provide places for recreation, tourism and religious rituals.
- Rivers sustain plants, animals, habitats and ecosystem processes that are important for nature conservation.

What is Integrated Water Resource Management (IWRM)?

IWRM "promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (Global Water Partnership, 2000).

IWRM is based on the concept that different water resources (rivers, wetlands, estuaries and groundwater) are all linked by the hydrological cycle to each other, the surrounding environment and human activities that influence them. Thus, in order to ensure sustainable, equitable and efficient water use, water resources need to be managed in an integrated manner that takes into account water availability, quality and use, as well as the environmental and socio-economic issues. IWRM requires co-operation and co-ordination between decision makers from an international to local level. Water users must participate in the management of water resources at all levels.

IWRM is also about providing sufficient information about water resources for informed decision-making. The River Health Programme is one such monitoring programme which provides water resource managers with information on river health and allows them to manage South Africa's water resources in an ecologically sound way.

Introduction (Continued)

What is the River Health Programme?

The Department of Water Affairs and Forestry, custodian of South Africa's water resources, protects the health of aquatic ecosystems and ensures the sustainable use of water. The River Health Programme, operational since 1994, is a key part of this responsibility.

The River Health Programme assesses the biological and habitat integrity of rivers (through evaluation of, for example, fish, aquatic invertebrates and riparian vegetation). This assessment enables us to report on the ecological state of our river systems in an objective and scientifically sound manner. Information from the River Health Programme allows for the identification of those areas where unacceptable ecological deterioration is taking place. This programme reflects the effectiveness of existing river management policies, strategies and actions.

The monitoring of aquatic ecosystem health is a legal requirement under the National Water Act of 1998 and the results are important for the application of the National Environmental Management Act (1998). The River Health Programme is a collaborative venture and partnerships are vital for its success. The national organisations leading the River Health Programme are the Department of Water Affairs and Forestry, Department of Environmental Affairs and Tourism and the Water Research Commission.

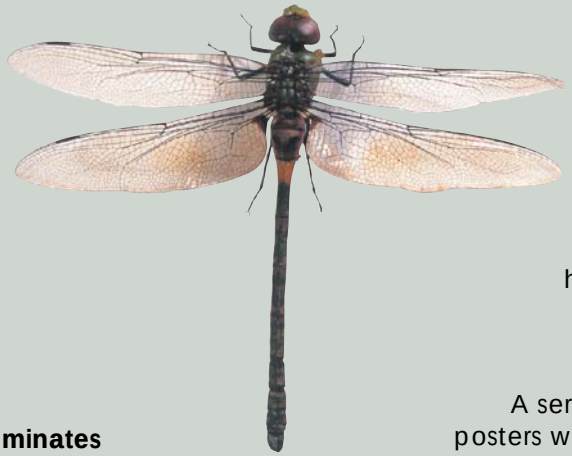
Why Do We Monitor and Report on River Health?

'River health' is the overall condition of the river. The term can be compared to the health of a person or an economy. Rivers are central to our welfare and economic development. Their health is essential for our well-being.

Healthy rivers provide goods and services which contribute to human welfare and economic growth. Knowledge of the impacts on a river provides insight into why the river is in its present health.

What are State-of-Rivers Reports?

State-of-Rivers reporting is an offshoot of State of the Environment (SoE) reporting which has become popular over the past decade. The aim is to provide better information for environmental decision-making. The national SoE for South Africa uses the Driving Force-Pressure-State-Impact-Response framework to explain what causes environmental change, the wider implication of that change and what we can do to manage the change.



State-of-River reporting disseminates information on river health to:

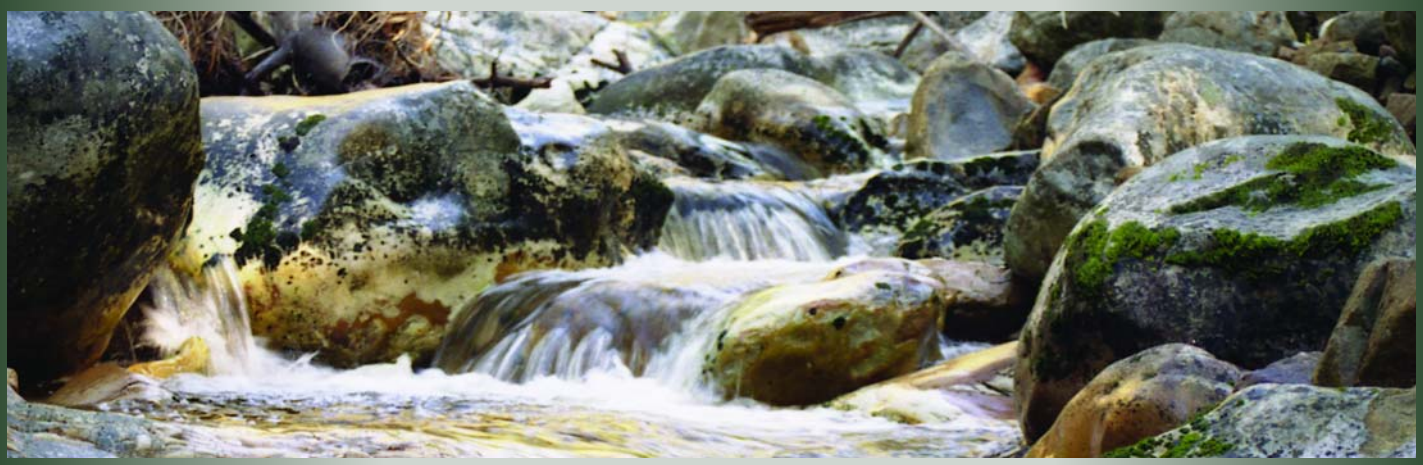
- **assist in ecologically sound management of rivers,**
- **inform and educate people regarding the condition of our rivers, and**
- **encourage wide participation by all stakeholders.**

How To Read This Report

This introductory section deals with the overall aims of the River Health Programme. The next few pages provide general information on the methods and the study area, followed by three sections dealing with the river in detail.

Each section consists of two double page spreads outlining the catchment area, present and desired health, pressures on the river and key management actions needed.

A series of River Health reports or posters will eventually cover all major river systems in South Africa. These will be regularly updated.



River Health Indices

What are River Health Indices?

Many physical, chemical and biological factors influence river ecosystem health, e.g. geomorphology, hydrological and hydraulic regimes, water quality, instream and riparian habitats and a host of biological processes. The River Health Programme focuses on selected ecological indicator groups that represent the larger ecosystem and are feasible to measure. This report uses river health indices to present data in an easy-to-understand format. The following indices have been used in this report:

Index of Habitat Integrity (IHI)

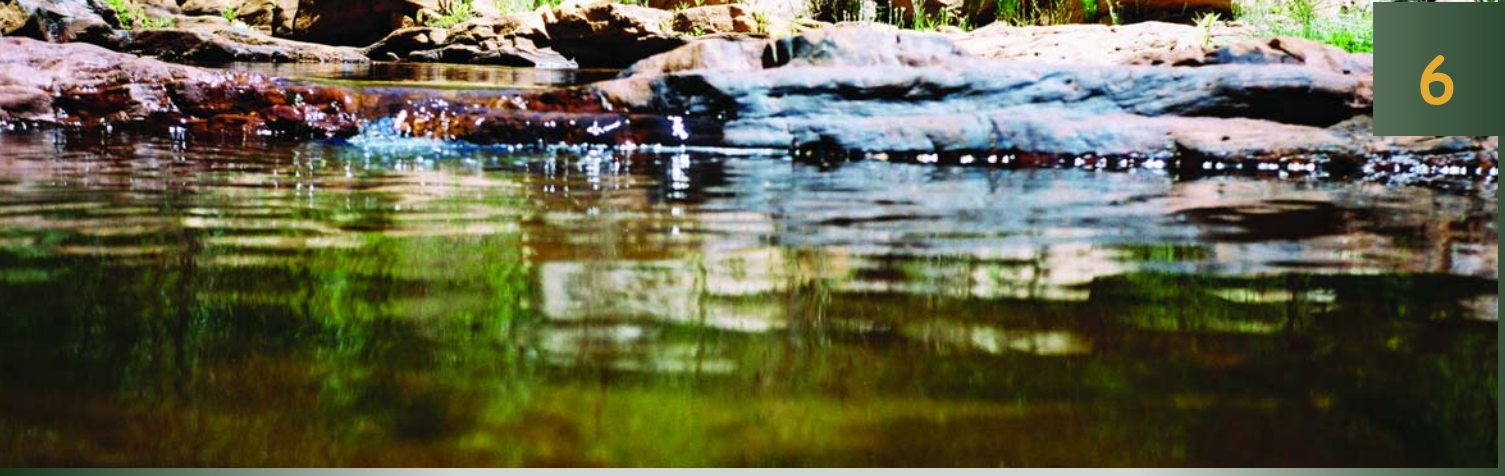
The availability and diversity of habitats are major determinants of the biota that are present in the river. The IHI assesses the impact of human disturbance on the riparian and in-stream habitats.

Geomorphological Index (GI)

Geomorphological processes determine the size and shape of river channels, which in turn define the type of habitat. The GI reflects the channel condition and channel stability.

South African Scoring System (SASS)

Aquatic invertebrates (e.g. insects) require specific habitats and water quality conditions for at least part of their life cycle. Invertebrates are good indicators of recent localised conditions in a river. SASS is a relatively simple index, based on invertebrate families found at a site.



River Health Categories

The **present health** of a river is a measure of the present ecological state of the river during the time of the survey and is presented in terms of the river health categories given below.
The **desired health** of a river is the envisioned future ecological state of the river. It is based on ecological considerations, the need for sustainable development and management actions concerning the river environment.

Desired health: Good

River Health Category	Ecological Perspective	Management Perspective
Natural N	No or negligible modification	Relatively little human impact
Good G	Biodiversity and integrity largely intact	Some human-related disturbance but ecosystems essentially in good state
Fair F	Sensitive species may be lost, with tolerant or opportunistic species dominating	Multiple disturbances associated with the need for socio-economic development
Poor P	Mostly only tolerant species present; alien species invasion; disrupted population dynamics; species are often diseased	High human densities or extensive resource exploitation

Riparian Vegetation Index (RVI)

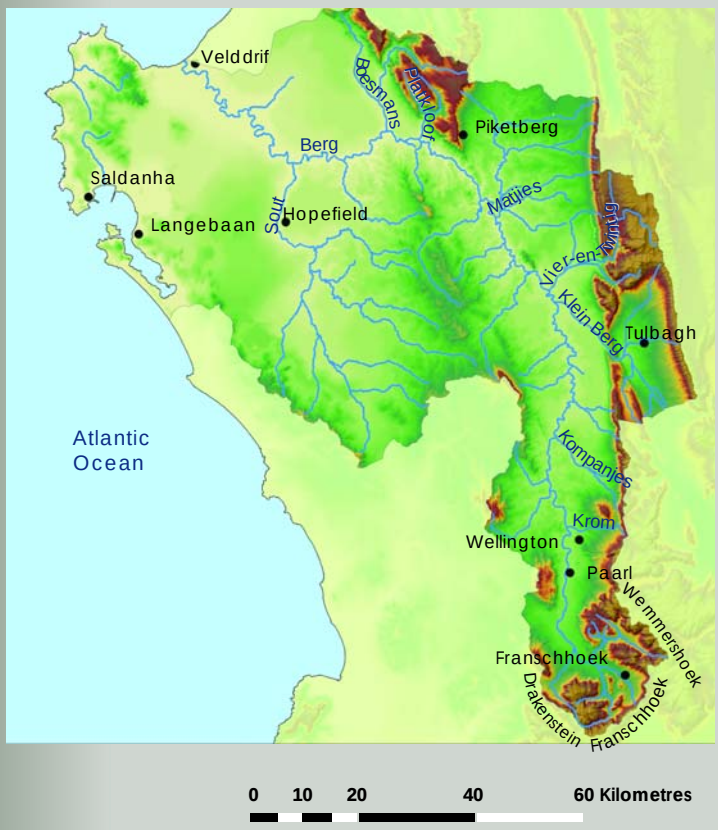
Healthy riparian zones help to maintain the form of the river channel and serve as filters for sediment, nutrients and light. Plant material from the riparian zone is an important source of food for aquatic fauna. RVI is a measure of the degree of modification of the riparian zone from its natural state.

Fish Assemblage Integrity Index (FAII)

Fish are good indicators of long-term influences on general habitat conditions within a reach. The FAII is an expression of the degree to which a fish assemblage deviates from its undisturbed condition. The FAII was adapted to make it applicable to rivers with low fish diversities.

Overview of the Study Area

The Berg River drains an area of approximately 8 980 km² and has a total length of about 285 km. It has nine major and seven minor tributaries, six of which were naturally perennial, namely the Franschhoek, Wemmershoek, Dwars, Klein Berg, Vier-en-Twintig and Matjies rivers.



The Berg River rises in the Franschhoek and Drakenstein mountains at an altitude of 1500 m. It flows northwards past Paarl, Wellington, Hermon and Gouda, where it is joined by the Klein Berg and Vier-en-Twintig rivers. The river then flows westwards past Porterville, Piketberg and Velddrif where it finally discharges into St. Helena Bay on the west coast.

The Berg River catchment falls within the winter rainfall region of the south-western Cape. Rainfall in the catchment increases from west to east. Most of the original vegetation has been replaced by agricultural and urban development, with the last remnants of natural vegetation found on the higher lying areas where steep slopes are not conducive to development.

	Upper Berg River & Tributaries	Upper Middle Berg River & Tributaries	Lower Middle Berg River & Tributaries	Lower Berg River & Tributaries	Floodplain & Estuary
Main Tributaries	Franschhoek, Wemmershoek	Dwars, Hugos, Krom, Kompanjes, Bot, Doring, Sand	Klein Berg, Vier-en-Twintig, Drieheuwels	Matjies, Boesmans, Platkloof, Sout	
Catchment size (km^2)	298	1 016	1 987	3 606	2 005
Geology	Table Mountain Group (quartzitic sandstone), Sandy sediments	Table Mountain Group (quartzitic sandstone), Malmesbury Group (shale), Cape Granite Suite, Sandy sediments	Table Mountain Group (quartzitic sandstone), Malmesbury Group (shale), Klipheuwel Group, Sandy sediments	Table Mountain Group (quartzitic sandstone), Malmesbury Group (shale), Cape Granite Suite, Sandy sediments	Cape Granite Suite, Sandy sediments
Vegetation	Fynbos (Sandstone, Alluvium, Afromontane Mires)	Fynbos (Alluvium, Afromontane Mires, Sand, Sandstone), Renosterveld (Shale, Granite)	Fynbos (Sandstone, Shale, Alluvium), Shale Renosterveld	Fynbos (Sand, Sandstone, Alluvium), Renosterveld (Shale, Granite, Silcrete, Alluvium)	Fynbos (Sand, Shale) Strandveld (Calcareous, Dune, Granite, Limestone)
Mean annual precipitation (mm)	1 412	817	722	394	300
Mean annual evaporation (mm)	1 495	1 548	1 624	1 540	1 460
Mean annual runoff (m^3)	277 X 10^6	263 X 10^6	288 X 10^6	97 X 10^6	17 X 10^6

The main ecoregion in the Berg catchment is the South Western Coastal Belt. Small areas of the Southern Folded Mountains and the Western Folded Mountains regions occur in the south and in the west.

Ecoregions and Geomorphological Zones

Ecoregions and geomorphological zones are a way of grouping areas of similar ecological characteristics (e.g. climate, geology and vegetation) and geomorphological features (e.g. slope). These features are important factors influencing the distribution of biota associated with different zones.

The **South Western Coastal Belt** is typified by renosterveld-covered plains.

The **Western Folded Mountains** are typically moderate to high mountains covered with Mountain Fynbos.

The **Southern Folded Mountains** consist of moderate to high mountains covered by Grassy and Mountain Fynbos and Little Succulent Karoo.

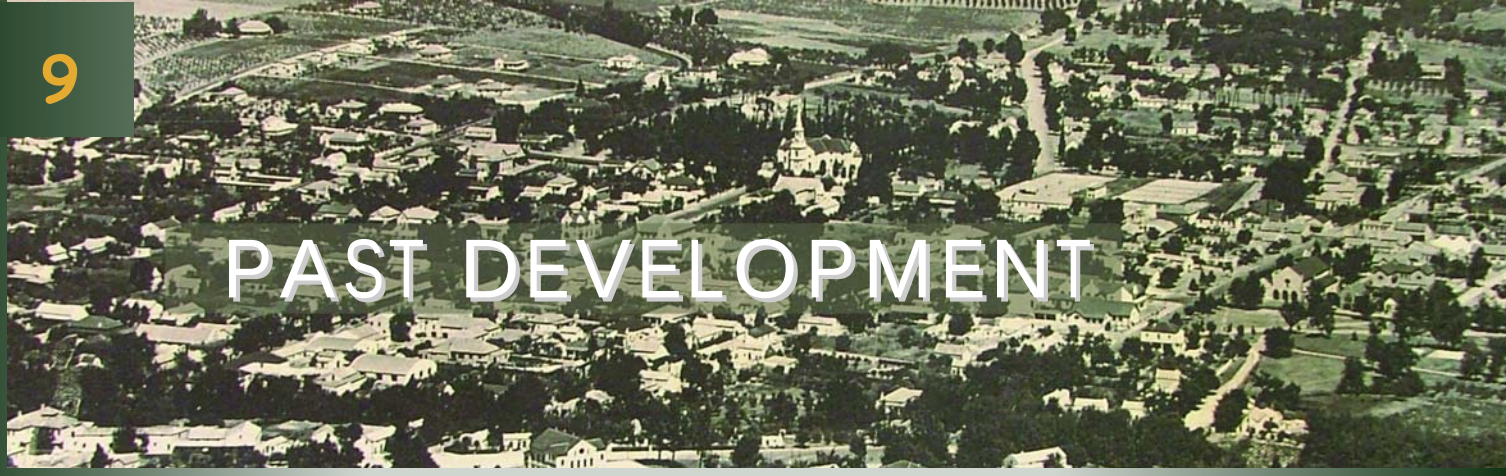
Mountain Stream Zone

Upper Foothill Zone

Rejuvenated Foothill Zone

Lowland River Zone

Lower Foothill Zone



PAST DEVELOPMENT

The San, people whose genetic origins can be traced back to the beginning of modern humanity, were the first known indigenous inhabitants of the Berg Catchment. They were widely dispersed, occurring mostly in the lowlands, and subsisted by hunting game with bows and arrows and gathering edible plants and honey. The distribution of the San across the region varied according to the availability of food and water and required these hunter-gatherers to alter their kinship group sizes from time to time.

Approximately 2000 years ago, Khoekhoe pastoralists moved into the area and started competing with the San for game. Evidence shows that these first farmers were sheep herders, with cattle being introduced some 500 years later. Due to the low nutritional value of the fynbos, the Khoekhoe groups were forced to follow a nomadic lifestyle. A Khoekhoe group, the Cochoqua, followed set grazing routes between Saldanha Bay and the Swartland throughout the year.

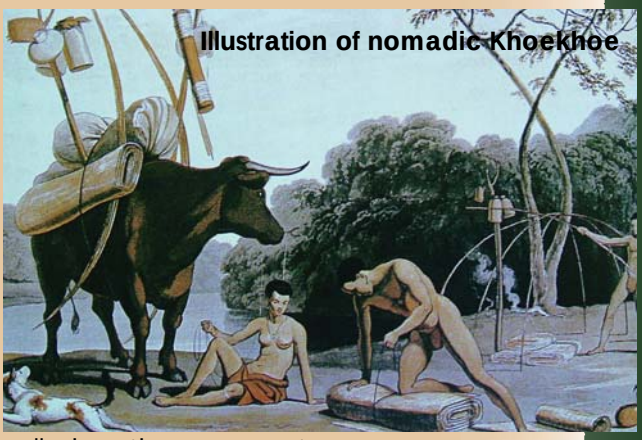


Illustration of nomadic Khoekhoe

Although the Khoekhoe were herders, they relied on the same water resource for crop-growing and on game to supplement their diet. This led to conflict between the two groups but due to the vastness of land in relation to their low numbers, co-existence was possible and their impact on the surrounding environment was small. It was not until the arrival of the first Europians in the seventeenth century that the way of life and existance of both the San and the Khoekhoe was seriously threatened. Conflict with the colonists resulted in the virtual disappearance of the San while the Khoekhoe continued to trade with the Dutch. Conflict over land, disease and enslavement resulted in the Khoekhoe living a precarious existance, where much of their language, religion and cultural heritage was lost.

Rock painting, with eland a common image in rock art of the Western Cape