

2017



THE FRESHWATER
RESEARCH CENTRE

ANNUAL REPORT





contents

04 Our Vision

06 Monitoring & Management

08 Resource Protection & Conservation

10 Climate Change

12 Water & Livelihoods

14 Training

16 Education & Outreach

17 Donors & Partners

18 Board Members & Researchers

“Water is the most critical resource issue of our lifetime and our children’s lifetime. The health of our waters is the principal measure of how we live on the land.”
Luna B. Leopold



Our Vision

FRC is a non-profit organisation that undertakes research across a range of disciplines in the field of freshwater science. The centre promotes cross-cutting, collaborative and relevant research and is committed to developing innovative solutions for balancing human need and ecological requirements for water. Members are specialist river and wetland ecologists, with collective research experience exceeding 150 years.

Freshwater is widely acknowledged to be fundamental to economic and social well-being, and its availability or scarcity is rapidly becoming one of the planet's most pressing environmental concerns. Sustainable use of water resources is essential if human societies are to continue to derive long-term benefits in the face of local development needs and global climate change. Integral to the FRC's philosophy is the conviction that water is not just a resource, but an essential element for the sustenance of life itself, and that maintaining healthy aquatic ecosystems is central to the continued existence of human society.

Freshwater is essential for survival, yet this valuable resource is threatened by human activities that continue to degrade its quality and quantity. Water resources are particularly threatened in countries like South Africa where the climate is generally semi-arid and water resources are naturally scarce. To effectively manage water resources, it is imperative that we understand how freshwater ecosystems function and the ecological consequences of water use.

Our goals are to achieve a thorough understanding of how freshwater ecosystems are structured and how they function, to improve our ability to use water resources sustainably, and to predict the effects of climate change and other human-related impacts on the integrity of freshwater ecosystems.

Our vision is to undertake collaborative research that is relevant, data-driven, scientifically defensible and which promotes the effective management, conservation and rehabilitation of freshwater ecosystems in Southern Africa. We are committed to promoting excellence in research, training and education, and through these channels better understand and cope with global change in freshwater ecosystems.

Our mission is to generate knowledge related to the structure and function of freshwater ecosystems in southern Africa and to translate this knowledge into a form that will guide the management and conservation of these systems for the benefit of all. We aim to share this knowledge with society and raise awareness of the value of freshwater ecosystems through traditional and digital media channels, as well as peer reviewed literature. We strive to develop local capacity in the aquatic sciences through supervising and mentoring students and by providing internship opportunities. Our environmental education and outreach programme - Living Labs - exposes school groups to the wonders and values of healthy ecosystems, providing an opportunity to learn about science through participating in real river health assessments.



Developing, testing & implementing freshwater monitoring systems, tools and techniques that inform management and decision-making



Monitoring & Management

FEPAs & Flows We successfully completed the WRC-funded 'FEPAs & Flows' study which developed a simple Excel-based tool to monitor the Ecological Reserve that can be broadly applied in rural catchments with limited water resource management capacity and monitoring. These areas are also characterised by a decentralised water storage and transfer infrastructure, but which have a high conservation and biodiversity value, i.e. Freshwater Ecosystem Priority Areas (FEPAs). During the course of the study we developed an elementary method – the Standardised REserve Analysis and Monitoring tool (STREAM) – for monitoring the Reserve in catchments characterised by run-of-river abstractions, limited flow monitoring infrastructure decentralised water resource infrastructure. *Project Value: R 317,000.00*

Periphyton Indicators This year we also completed a WRC-funded study to develop and test cost effective and user-friendly tools that use periphyton as an indicator of flow and nutrient alterations in rivers. Periphyton are ideal for setting resource quality objectives, monitoring compliance and then informing adaptive management solutions. This research will improve our ability to manage rivers more effectively and thus maintain their resource value such that goods and services provided by these systems can be sustained. Understanding the role of periphyton communities in the maintenance of river ecosystem integrity will positively impact on the biodiversity value and protection of river ecosystems. The tools and protocols developed are

directly applicable to aquatic ecosystem health monitoring, including providing a potential direct input to the Ecological Reserve process.
Project Value: R 1, 223 574.00

Freshwater Biodiversity Information System 2017 was the start of an exciting new project supported by the JRS Foundation freshwater biodiversity information system for evaluating long-term change in rivers in the Cape Floristic Region of South Africa. Our vision is that the information system will encourage and accept a consistent flow of relevant, reliable freshwater biodiversity data from a network of strategically-located sites, into a reputable, open-access database, and will translate these data into a form that is accessible to end-users like biodiversity managers. *Project Value R 4, 000 000.00*

Ecological State of Wetlands The broad aims of this current project are (1) to engage with key stakeholders to clarify user requirements for a wetland PES assessment tool (or suite of tools), and to agree on an assessment framework for different types of wetlands and levels of PES assessment; (2) to integrate the existing Wetland PES assessment tools into a single suite of user-friendly tools, in line with user requirements, and to address the shortcomings of the existing methods; and (3) to undertake iterative testing of draft versions of the PES assessment tools so as to continually refine and improve the tools that are developed.
Project Value: R 1, 500 000.00



Supporting sustainable water use and conservation in water-scarce biodiversity-rich regions of southern Africa



Resource Protection & Conservation

Cape Critical Rivers Project

The Cape Critical Rivers (CCR) Project is an ongoing initiative that aims to bridge biodiversity conservation with water resource management in the Western Cape, South Africa in original ways. Supported by the Save Our Species (SOS) fund, the Endangered Wildlife Trust's (EWT) Drylands Conservation and Source to Sea Programmes are working with project partners, CapeNature, the Department of Environment and Nature Conservation, Northern Cape (DENC) and the Freshwater Research Centre (FRC) towards protecting threatened freshwater ecosystems and species in the Cape Floristic Region (CFR). Its primary objective is to support the implementation of Biodiversity Management Plans (BMPs) for two endangered CFR freshwater fish species: the Clanwilliam sandfish and the Barrydale redbfin.

This year saw critical interventions by the project team to ensure that abstraction infrastructure in Barrydale is adapted to enable environmental releases to be made to support populations of the Critically Endangered Barrydale redbfin.



Mitigating the Risk of Agricultural Nonpoint Source Pesticide Pollution

Considering the increasing challenges related to water quality management in South Africa and acknowledging the role of nonpoint source (NPS) pesticide pollution in deterioration of water quality, the aim of this WRC-funded project is to use monitoring, modelling and risk assessment approaches to identify specific management and farming practices aimed at reducing the impact of waterborne agricultural chemicals on water resources.

The general approach adopted in the execution of this project is one that it is aimed at providing an integrated approach to reducing the impacts of agricultural chemicals in the aquatic environment. The underlying principle of the approach is that management and farming practices need to (1) identify target areas where agricultural NPS pollution of pesticides is of greatest concern, (2) target specific pesticides which are of greatest concern and (3) be designed to address the most important cause of contamination, by improving application, selecting pesticides which pose less risk to the aquatic environment, or reducing the transport of chemicals from source to the aquatic environment.

Project Value: R 3, 500 000.00



Assessing and predicting the affects of climate change on aquatic ecosystems to inform future water resources management and policy



Climate Change

Vulnerability of CFR freshwater fishes to climate change

2017 saw the conclusion of another innovative and exciting study examining the vulnerability of Cape Floristic Region freshwater fishes to climate change co-funded by the WRC and TMF. Moving forward into the 21st Century there is now little doubt that human-linked climate change will come into play as a major factor impacting on CFR aquatic biodiversity, including the already-imperilled



freshwater fishes of the region. Indeed, climate change predictions for the CFR, a Mediterranean Climate Region, are severe, with significant increases in water temperature and rainfall variability, and decreases in total runoff, forecast for the region. The consequences of these changes are likely to be especially severe for CFR fishes since remaining populations are now largely restricted to headwater habitats where small changes in river temperature or run-off could have dramatic effects on abundance, distribution and species survival. Moreover, the interplay between these predicted hydrological changes and the impacts of alien invasive fish is a

further cause for concern, with the distributions of key alien species apparently largely driven by temperature thresholds. The results of this study will contribute to our understanding of freshwater fishes in the CFR, and inform decisions as to the vulnerability of indigenous fish species to climate change, coupled with the threat of alien invasive fish species. In combination, these proposed activities will allow for an assessment of the level of extinction risk to the indigenous fish communities in the CFR and allow for the prioritisation of river reaches for conservation action.

Project Value: R 2, 387 000.00

Water temperature Guidelines

This project follows on from two preceding WRC-funded projects related to water temperature, biotic response and vulnerability of aquatic organisms to climate change. We have established a solid scientific platform of thermal research in South Africa, but to date this information has not been explicitly translated into practical management steps for determining the thermal component of the ecological Reserve and for setting water temperature targets. The project team are bridging the gap between science/research and management/ implementation, by taking the body of research on water temperatures generated over the last ten years, and packaging it in ways that best serves the end users.

Project Value: R 1, 500 000.00



Supporting the sustainable and equitable water use in a water-scarce agricultural regions of Southern Africa



Water and Livelihoods

Biodiversity and water in the

Kouebokeveld

The FRC promotes biodiversity conservation of freshwater ecosystems by enhancing their resilience, adaptive capacity and restoration. The unprecedented effects of climate change, including unpredictable rainfall patterns and drought, have adversely affected river flows in catchment areas. The Olifants-Doring river system within the Cape Floristic Region is highly significant in terms of biodiversity conservation. Water resources



are used for agricultural and human use, resulting in socio-ecological systems with complex dynamics including water scarcity, quality, quantity, equity and governance. Integrated, sustainable management requires bridging catchment and resource management efficiently. This project - funded by the Hans-Hohesein Charitable Trust - aims (1) to gather, collate and synthesise existing fragmented data sources and information relating to impacts of climate change on freshwater ecosystems and their

associated biodiversity, including deliberations and discussions of present and future scenarios with stakeholders; (2) to proactively assist in developing Integrated Water Resource Management (IWRM) by mobilising and capacitating stakeholders to identify climate change adaptation and resilience strategies through providing practical mechanisms; and (3) to develop and institutionalise information water management systems, including models for monitoring and feedback, which enhance efficiency, capacity and resilience of the interrelated ecosystems. *Project Value: R 1, 068 000.00*



South African Scoring System (SASS) training and accreditation



Training

BIOMONITORING TRAINING

FRC successfully ran two SASS5 Aquatic Biomonitoring training courses. SASS (South African Scoring System) is the cornerstone of river monitoring and is widely used by river practitioners in South Africa to assess the health of our rivers. The four-day courses involved a combination of theoretical and practical training on SASS and the identification of aquatic macroinvertebrates. A total of 29 individuals from a range of organisations, including government, water resource and conservation agencies (16), non-governmental organisations (4), universities (2) and consultants (7) received training. Two SASS accreditation days were run, with a total of 19 participants attending.

Looking forward, FRC will again offer SASS training and accreditation in 2018. Our goal for this year is to extend the training offered to include other practical courses that river and wetland practitioners require and which we are skilled to offer.



Fostering meaningful relationships between our youth and their environment and
nurturing more conservation-conscious future generations



Education & Outreach

The Living Labs

The Living Labs outdoor education programme – the FRC's education and outreach arm – was launched on 22 Mar 2017 on World Water Day. Our vision is to foster meaningful relationships between our youth and their environment and thereby to nurture more conservation-conscious future generations.

The purpose of the programme is to create opportunities for our youth to develop meaningful connections with nature; to offer a hands-on, outdoor science learning experience and to contribute meaningful scientific data on changes to the ecological health of South Africa's rivers. This is achieved through working with our partners including the Two Oceans Aquarium, Friends of the Liesbeek and Cape Leopard Trust. The programme provides school groups with outdoor experiences at safe, accessible sites on rivers – sites that the schools are encouraged to 'adopt' - care for, monitor and learn from through repeated visits. Each outing is run by trained facilitators and is based on lessons and activities specifically designed to complement school curricula.

In 2017 alone, Living Labs has reached 697 learners from 21 schools, 8 of which are under-resourced and historically disadvantaged. We uploaded 21 biomonitoring (miniSASS) data points from 7 rivers. The majority of outings visited Cape Town's Liesbeek River, but we also visited rivers as far afield as the Palmiet in Grabouw, and Stellenbosch.

Looking forward, 2018 is set to be an exciting year, and with generous support from the National Geographic Society, the Cape Town Environmental Education Trust and KEEN Footwear, plans are already underway to improve the impact of the experience, to revisit many of the schools we worked with in 2017 and to expand the network to new schools and rivers throughout the Western Cape.

"I had the privilege of being apart of pioneering the first Living Labs River Day, that was held on World Water Day in 2017. The programme exposed me to the values of a healthy ecosystem, and how simple it is to assess the health of a river using miniSASS. It was an experience I will always remember!"

–Tara Bird (Matric learner from Cedar House School)



Donors & Partners

DONORS

Water Research Commission of SA (WRC)
JRS Biodiversity Foundation (JRS)
National Geographic
Joint Nature Conservation Committee (JNCC)
Red Meat Research & Development South Africa
Hans Hoheisen Charitable Trust
Table Mountain Fund (TMF)
Cape Town Environmental Education Trust (CTEET)

PARTNERS

University of Cape Town
University of Stellenbosch
Nelson Mandela Metropolitan University
South African Institute for Aquatic Biodiversity
CapeNature
Department of Environment and Development Planning
South African National Biodiversity Institute
Department of Agriculture Landcare
University of the Western Cape
Department of Water and Sanitation
Institute of Natural Resources

Board & Researchers

BOARD OF DIRECTORS

Dr. Helen Dallas
(Executive Director)

Dr. Jenny Day
(Director)

Dr. Bruce Paxton
(Director)

Marycke Roche
(Financial Director)

RESEARCHERS

Dr. Nick Rivers-Moore
(Water Ecosystems)

Dr. Jeremy Shelton
(Water Ecosystems)

Christy Bragg
(Climate Change Adaptation)

Dr. Justine Ewart -Smith
(Water Ecosystems)

Dr. James Dabrowski
(Water Quality)

Jeanette Walker
(Social Ecology)

Kate Snaddon
(Wetlands Science)

Dean Ollis
(Environmental Assessment)

Pashni Pillay
(Water Ecosystems)

Toni Olsen
(Water Ecosystems)

Tumisho Ngobela
(Water Ecosystems & GIS)

ADMINISTRATION & ACCOUNTING

Janette Lumley
(Office Administration)

Marycke Rosche Acc.
(Accountants)

Verryn & Co.
(Independent Auditors)

STUDENTS

Nonkanyiso Zungu
(PhD Student)

Pfananani Ramulipho
(PhD Student)

Jody-Lee Reizenberg
(PhD Student)

Keir Lynch
(MSc Student)

Mohammed Kajee
(Msc Student)

INTERNS

Melandri Rafferty
(Intern)

Phillip Frenzel
(Intern)



JEREMY SHELTON

We would like to extend our gratitude to the donors who
generously contributed to our successes in 2017



2017 Financials