



RHODES UNIVERSITY
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Environmental Science

Newsletter

April 2009

Expectations for 2009 from the HoD

After the busy 10th anniversary activities in 2008, we all need a break and so our expectations for 2009 may seem insignificant. But we have to remind ourselves of the success for the 10th anniversary activities and in doing accept that we cannot keep up such a pace every year, and a bit of 'rest' (relatively speaking) might just be the best thing for us. That does not mean nothing is going to happen, but rather that this year will be more of a focus on consolidating and improving previously held events. For example, the annual relay race to Port Alfred, but now linking it with raising funds for a local environmental NGO. Another example is that we will again be hosting the schools environmental quiz which was an outstanding success last year. A key evolutionary process will be Fred Ellery taking over as Head of Dept from Charlie Shackleton as of mid year. Charlie will be on sabbatical for 12 months, and thought it would be good to coincide it with a change in leadership rather than just a temporary replacement for his sabbatical period. But he will be on hand to support Fred and the department. Another new event will be the launch of a public short course in Tools for Wetland Management to be led by Fred. Mid year will also see the arrival of Prof Jack Putz and Dr Claudia Romero from the University of Florida in the USA. They will be spending about six weeks as visiting lecturers in the department. They have a wealth of experience in tropical systems throughout the world, and are bombarding us with ideas of activities they wish to offer and lead during their stay. One gets the impression that we may be hit by a tornado for a few weeks. Clearly some of their ideas will have to be tempered by what is doable in the time available to them, but at least there is no shortage of ideas.

Something that will require some significant planning for is the anticipated large increase in undergraduate numbers next year. For 2009, the number of first years in Geography 1 (as a compulsory prerequisite for Enviro) has moved from 185 in 2008 to 238. Of the current first years over 90 have indicated that they wish to major in Enviro next year. Using last year's ratios that will translate into a second year Enviro class of approximately 85

students. However, our teaching approaches and practical exercises were never designed for such numbers, and we will have to be innovative in how we will cope. The sooner we start planning for that the easier the transition will be. Coupled with is how to implement the university's new policy on service learning. We have always practiced service learning in the department, but now it is being promoted university wide, and we need to seek opportunities to increase and improve our efforts so far, and continue to be innovative and leader in this teaching and learning approach.

-Charlie Shackleton

2008 Research outputs

The 2008 research output from the department was once again something to be proud of, although a little down on the previous couple of years. We had 12 papers in refereed journals, five book chapters, and 16 conference presentations, which, although lower than previously, is still well above the university and national norms on a per capita basis. Particularly pleasing was the high number of conference presentations led by postgraduate students. The dip in subsidy-earning publications was balanced by a good output of postgraduates, with four Masters (Dylan McGarry, Collins Nsor, Jim Saunders and Melita Steele) and one PhD (Kelly Scheepers) graduating during the 2008 academic year. Graduation of postgraduates is included in the university's measure of research output reported to the national dept of education. Kelly was the first PhD graduate from the department who started as an undergraduate with us and progressed through to the PhD level – a significant landmark for our young department. During 2008 we had the largest ever Honours and joint Honours class, which should bode well for publication output in the next year or so. Matt McConnachie's application to upgrade his Masters degree to a PHD was successful.

In January the department hosted a four day international policy dialogue on the contribution of African indigenous vegetables to urban agriculture in African cities. It was the culmination of a two-year European Commission funded project exploring the same

topic. The primary aims of the workshop to (i) summarise and highlight the key scientific messages, (ii) translate the scientific messages into policy lessons and language, and (iii) deliver the policy lessons to a selection of invited policy makers. It was attended by 85 policy makers and scientists, mostly from other African countries. A book will be published in mid 2009, and is already advertised on the Earthscan website.

Baviaanskloof Honours Field trip: February 2009

A field trip was undertaken to the western Baviaanskloof by students doing Honours Degrees in Environmental Science and in Geography (Environmental Water Management). The trip was led by Professors Fred Ellery and Kate Rowntree, with able assistance provided by Brigitte Melly and Kathy Cassidy. The field trip focused on the science of the environment, with particular emphasis on the ways in which people interact with the land and with water to achieve certain objectives, and often leading to unintended and undesirable outcomes. It attempted to develop knowledge and a set of skills that deal with water for people and the environment – the overarching goal of South Africa's National Water Act.

The Baviaanskloof is being viewed as a potential centre for research into links between humans, terrestrial and fluvial systems, and the system is appropriately scaled from the source to the sea. As such the system can be considered from the perspective of integrated catchment management, and the focus on the field trip was to improve understanding of this social-ecological system at the scale of the Baviaans River Catchment.

The purpose of the field trip was to give students a sense of the structure and functioning of the Baviaanskloof fluvial system and its links with its catchment and with land use in the catchment and on the "floodplain". As part of the excursion we established a broad conceptual model of how the floodplain works, and its relationship with microcatchments that feed onto the floodplain. We established the nature of land use in the catchment and on

the floodplain and considered the impacts of these on floodplain processes, including altered hydrological processes as well as erosion and sedimentation. In some cases we considered appropriate steps that might be taken to mitigate impacts that have already happened, and made recommendations to individual landowners.

In order to achieve this overall aim, we undertook the following activities:

- Plot the longitudinal profile of the Baviaans River from its source to its confluence with the Kouga River

- Examine the morphology of the floodplain surface and its relationship with bedrock

- Examine regional and local variation in floodplain sediment characteristics

- Examine human activities on the floodplain and consider their impacts

- Identify the extent and character of subcatchments draining onto the floodplain

- Examine the morphology of tributary alluvial fans on the floodplain and its margins

- Examine human activities on tributary alluvial fans and consider their impacts

- Examine human activities in catchments and consider their impacts on the floodplain

The head of the valley of the Baviaans River is at an elevation of approximately 900 m and over a distance of approximately 85 km the valley floor drops to an elevation of approximately 150 m, with an average slope of 0.8% or 1:125 (Figure 1). The Baviaans River has a remarkably uniform logarithmic longitudinal profile, which is surprising given the mountainous nature of the terrain and its turbulent geological history of folding and faulting.

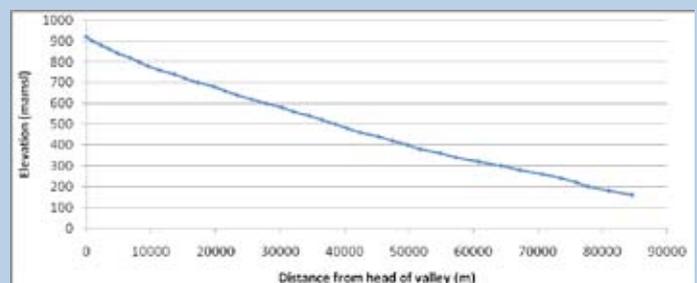


Figure 1: Longitudinal profile of the Baviaans River from the head of the valley to the confluence of the Baviaans River with the Kouga River.

Due to the steep mountainous nature of the Baviaanskloof terrain, streams entering the valley deposit sediment on the valley floor, giving rise to alluvial fans. These depositional features have characteristics that reflect the

size and geology of the catchments they drain. An appreciation was gained of this variation in character, with particularly striking differences between those on the northern side of the valley, which are smaller and steeper because they drain steep, small catchments on highly metamorphosed, clean sandstones, while those on the southern side of the valley are larger and shallower because they drain larger catchments that comprise a mixture of quartzites and shales. An alluvial fan on the southern side of the valley is indicated in Figure 2.



Figure 2: Example of an alluvial fan on the southern side of the valley of the Baviaanskloof Floodplain

Water Quality at Baviaanskloof

During the field trip in Baviaanskloof we did not come into contact with much water. However, whenever we did come across a stream or well, water quality testing was conducted. The most significant results of the water tests involved pH and Total Dissolved Solids, which are both indicators of water quality. In the Baviaanskloof, the pH values from the various testing sites were generally around 6.5, which is typical of catchments of quartzite and sandstone, but in a semi-arid environment such as this, one might expect slightly higher pH values. However, one site (the stream at the Kamerkloof Guest House) had a particularly high pH (8.75), which may be due to variation in local geology.

The concentration of dissolved salts is important as a high salt concentration may make water unsuitable for irrigation and other uses. Our results indicated that in general the salt concentrations were low, but that they increased slightly further downstream. This is to be expected as the groundwater picks up salts

as it flows through and weathers rock, and salt concentration also increases through water loss by evapotranspiration. Tributaries had a lower salt content than the main stream, showing that they should be the preferred source of water.

Another study regarding water testing was conducted during the pumping of the well on Zandvlakte Farm (Figure 3). The dissolved salt content of the water increased during pumping due to recharge by slightly more saline water. This was suggested to be linked to transpiration by trees surrounding the well, which take up water and leave behind dissolved solutes. Thus, when the ground water is replenishing the well during pumping, it is bringing dissolved salts into the well.



Figure 3: Testing the water quality at the well on the farm Zandvlakte

In addition to water quality testing, the impact of pumping of water for irrigation was examined by considering water levels (and volumes) of water pumped from the well (Figure 4). The elevation of the water surface declined rapidly during pumping, and when pumping stopped, the water level rose rapidly, followed by a sudden decline in the rate of recharge of the well (Figure 5). Nevertheless, recharge took place slowly such that by the following morning the original water level had been reached.



Figure 4: Students using a dumpy level and staff to measure water levels before and after pumping at the Zandvlakte well

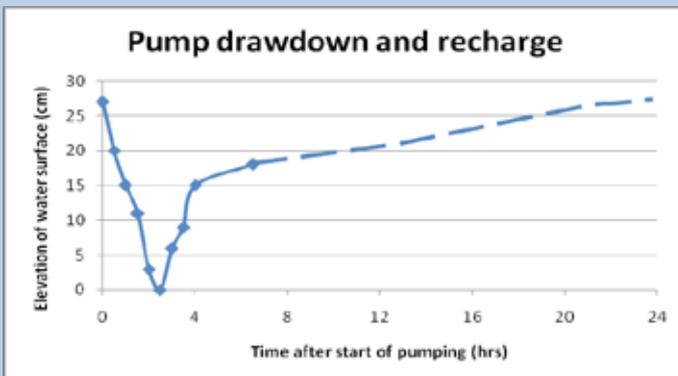


Figure 5: Measurement of water levels in the Zandvlakte Well during and after pumping

protect the upper section of the artificial channel to help water flow more directly onto the alluvial fan and hence the floodplain. However, due to steepening of the alluvial fan surface below the apex of the fan, interventions need to be taken at the apex of the fan in order to limit erosion on the steeper portion of the fan. Further measures that might be taken include improving infiltration capacity by using brush lines, which will help slow the water down and allow for increased infiltration. Monitoring of a system like this, following rehabilitation, essential, such that adaptive management might ensure learning and more sustainable action.



Figure 6: Prof Kate Rowntree talking to students who are sitting on the artificial berm overlooking the drainage furrow on the Gannal- and Kloof alluvial fan

Human impacts on tributary alluvial fans

We conducted research on an impacted alluvial fan in Gannaland Kloof. The aim was to investigate the impacts of human intervention and ways in which the land could be restored. The area was surveyed to produce a contour map and a number of cross-sections of the artificial channel and berm (excavated by a former landowner) were surveyed. This excavation (Figure 6) was undertaken to divert water away from the floodplain and directly towards the Baviaans River in order to protect arable land and infrastructure. However, this has resulted in no water being retained within the landscape and has led to drying.

One of the suggestions was to use the material in the berm to fill the drainage furrow, but it was found that because of erosion within the artificial channel, there was not sufficient material in the berm to fill it. Therefore, we suggested that the berm be used to plug and

Human activities on the Baviaans River Floodplain

Human activities on the Baviaans River Floodplain itself has led to erosion along the main watercourse such that former wetlands have been drained and destroyed. The existence of peat deposits and the burning of the peat in a fire that followed such erosion and desiccation, were clearly visible in the side wall of the eroded main channel (Figure 7). The presence of such features testify to the very dynamic nature of the baviaanskloof, and to the large and unintended impacts of small interventions by humans, such as draining the floodplain stream to increase the flow of water from agricultural lands.

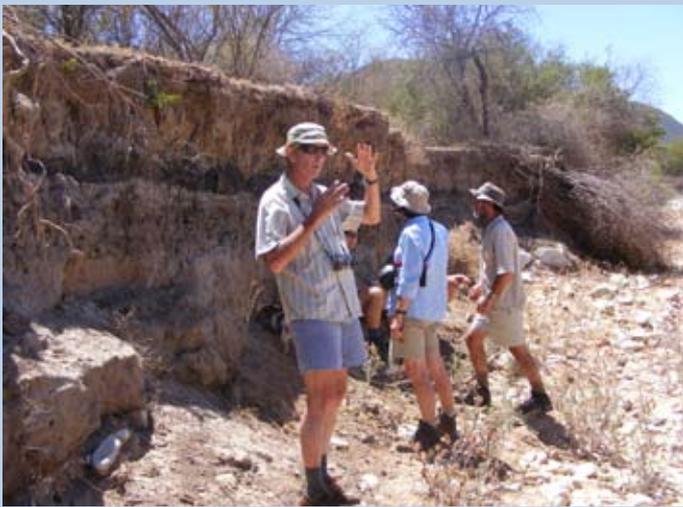


Figure 7: Prof Fred Ellery showing clear evidence of the former existence of a peat deposit and permanent wetland on the Baviaans River Floodplain, which had been dried by erosion and lowering of the water table. Peat fires had destroyed much of the former peat as indicated by ash layers above the peat deposit.

Testing the soil infiltration rates in degraded thicket

Another activity was to investigate the effect of soil capping by a crust of clay on the soil

surface on water infiltration rate in degraded vegetation. Infiltrimeters were used to measure this (Figure 8), and results clearly showed that infiltration rate is substantially reduced by the formation of capped soils (Figure 9). The infiltration rate is measured by the drop in the level of the water in the infiltrimeter.



Figure 8: Students measuring infiltration rate of water in a region of degraded thicket in the Baviaans River catchment.

Honours Student Intro table

Name	Project Title	Project Description	Other Interests & Hobbies
Michelle Evans	An analysis of the groundwater behavior in the Western Baviaanskloof: implications for floodplain rehabilitation	I am going to be examining the behavior of the groundwater system in the Baviaanskloof in situations where extraction is and is not taking place in order to establish the hydrological conditions that would govern rehabilitation on the floodplain	Cooking, music
Lara Crous	Aluminium in Grahamstown's Municipal water supply: An overview	Aluminium levels at Waainek water treatment works (in Grahamstown) has been identified as consistently exceeding Class II levels of the South African water quality guidelines. There is an association between aluminium and neurological diseases and so these findings are of a grave concern. In this project, I will test aluminium concentrations over a period of four months to determine if the problem persists as well as evaluate management protocol concerning water treatment. I will also suggest recommendations for management.	I've grown up on a farm and so naturally I love being outdoors and animals! I also enjoy hosting dinner parties and watching movies.

Anneka Johnson-Marshall	An investigation of human impacts on floodplain fluvial pattern and process: A case study of human intervention on Zandvlakte Farm in the Western Baviaanskloof	To investigate human interventions on the floodplain in the vicinity of Zandvlakte Farm in the Western Baviaanskloof, and examine how they have affected fluvial style and process, as well as suggesting possible measures for floodplain rehabilitation	The outdoors, animals, reading
Debbie Bekker	The status and use of aloe ferox in the grahamstown commonage	The use of Aloe Ferox in the Grahamstown commonage. I will be studying the people that harvest Aloe Ferox in the commonage and whether this harvesting is sustainable	Horse riding
Kyle Langley	An analysis of the morphology of the alluvial fans along the northern side of the Western Baviaanskloof: Implications for alluvial fan rehabilitation	I aim to establish the morphology of alluvial fans on the northern side of the Western Baviaanskloof and infer hydrogeomorphological processes with a view to making recommendations for rehabilitation. Basically this boils down to surveying alluvial fans in the area as well as measuring grain particle size along the alluvial fans. This data will be analysed and used to infer the hydrological processes which dominate the fluvial system.	I enjoy hiking and being outdoors and you will find me on a sunny beach more often than not as I am a born and bred Durbanite.
Patrick Curran	Analysing perceptions and potential willingness of businesses in the Makana/ Nelson Mandela Metropolitan Areas to offset carbon emissions through local initiatives	This project will look at various SMEs within the tourism and industrial sectors within the Makana/ Nelson Mandela Metropolitan Areas. These will be assessed for a variety of characteristics from knowledge surrounding climate change to willingness to offset carbon emissions. The promotion of local restoration/ offsetting initiatives will also be undertaken.	Travelling, Reading



International Conference on Implementing Environmental Water Allocations



Sandy Collings recently attended the international conference on Implementing Environmental Water Allocations held in PE from 23-26 February. The conference, organised by the Water Research Commission (WRC) and the Department of Water Affairs and Forestry (DWAf), attracted delegates from over 30 countries. The major theme for meeting was to promote the sustainable use of rivers, wetlands, estuaries and groundwater internationally. Objectives included identifying and critiquing global trends in the implementation of environmental water allocations covering policy and legislation, integrating ecosystem protection with socio-economic development, defining and involving stakeholders, decision making for sustainable use and operational management of water allocations.

Topics covered throughout the conference 'Integrated Management and Use' that addressed surface and ground water, water quality and quantity and biophysical and socio-economic issues. 'Institutional Mechanisms' covered local to international initiatives, stakeholder participation and training and capacity building. 'Decision-making and trade-offs' included awareness, policy and legislation, knowledge poor environments, balancing development and resource protection and valuating ecosystem services. 'Delivering Environmental Water' in terms of dam releases tackled the issues of delivering floods, maintaining variability and various constraints and solutions. 'Monitoring and Adaptive Management' considered one of the more important topics was also addressed.

The four days of presentations and discussions proved invaluable for the representatives present. Keynote speakers included Dr Rafik Hirji: The World Bank (USA), Dr Nick Davidson: Deputy Secretary General Ramsar (Switzerland), Dr Tom Lequesne:

WWF-UK. Representatives from Government offices, NGO's, conservation agencies, consulting firms and research institutions were present. University of New England, Griffith and Melbourne (Australia), Yale University (USA) were also represented, along with South African UCT, NMMU, uKZN, Free State and Rhodes University.

Not only did the conference open doors for new relationships, delegates were able to exchange experiences and knowledge from a variety of case studies. Popular studies mentioned throughout the proceedings were the Murray-Darling Basin (Australia), the Mekong River (South East Asia), the Pangani Estuary (Tanzania) and the Berg River (South Africa).

Given the scope and quantity of interest shown, along with the calibre of those in attendance, the conference was a great success.

Scheduled events for 2009

Although 2009 is already filling up with many academic engagements, there are also a number of more social events planned for the year.

- The inter-departmental staff and post-grad teas began with Botany on 13th Feb and we are looking forward to those ahead with Geography, Anthropology, Environmental Education and Botany.
- Our Grahamstown to Port Alfred relay run is also on the cards, where all Environmental Science students and staff are encouraged to brave the distance in order to raise sponsorship that will go towards addressing local environmental issues.
- Our post-grads will be helping out for The Khanya Maths and Science Club on two Saturdays this year. Pupils from local schools will spend a morning learning about various environmental issues.

Guest Lecturer Visits from USA

On the 26th of February, Patrick Shafroth, a Research Ecologist for the US Geological survey at the Fort Collins Science Center in USA, presented a lecture on the invasion of riparian ecosystems in Western North America by Tamarix. He gave an overview of the invasion processes and impacts linked

to Tamarix invasions, and then discussed management and restoration approaches, which was particularly interesting in both the differences and parallels to the South African situation. He was particularly interested in the scale of rivers that we are working in, as most of the restoration work in south Africa at present is located in headwater streams, as opposed to work in much bigger systems in the USA. He also commented on the unique opportunity that we have in South Africa, through embedding restoration within a poverty relief programme, of tackling invasion and restoration on a large scale, and the valuable research that this can provide.

Enviros tries out a research writing weekend

A couple of weeks ago Enviros held a writing weekend for staff and postgraduates who had papers in a very near final stage and just needed some consolidated time to get them completed. The target for staff was to write up at least one paper ready for submission based on one of the Honours level projects each had supervised during 2008. Postgrads who had papers close to completion were invited, but at the end of the day only Mike Powell came along. Zuki faded at the last minute! The whole trip was sponsored by the Dean's discretionary research fund and he is interested to learn what our final output was.

We left before tea on Friday and headed out to Nottingham Lodge in the Great Fish River Reserve. It has been recently renovated so now is reasonably swanky. It sleeps 10 (in five bedrooms) and one pays for the whole place. Thus, if we are to repeat the exercise, we need to fill all the beds to optimise our returns on the costs. Zelda arranged all the logistics and kept us overfed for the entire weekend. Approximately 100 hours of writing was done by the five of us and at least four papers should have been submitted by the time you are reading this newsletter, perhaps as many as six. We interspersed writing with dismayed conversation about South Africa's cricketers drubbing at the hands of the Aussies and game drives. On the former, Fred has agreed to offer his services to the Proteas, and we look forward to seeing him open the batting with Neil McKenzie for the third test. We think it should be counted as part of our community

engagement activities. On the latter we saw a good variety. The reserve was pretty green after the recent rains, and rhino were in abundance, one of which gave us quite a scare followed by some hurried reversing of the combi as it demonstrated its displeasure at having its afternoon snooze interrupted. Sheona got dunced of the weekend award for leaving the cable to her laptop in her office. Charlie got bad driver of the weekend award for getting stuck in the mud when he drove to go and collect the cable from the Fike's house the following day.

Alumni

Georgina Cundill (DES PhD 2008)

Georgina has recently moved across to Chile. She has taken the position of social ecologist at the Centre for Advanced Studies in Drylands at the University of La Serena at the edge of the Atacama Desert. Before starting in La Serena, George and her husband spent two weeks camping and driving through Patagonia. Their trip took them south from Bariloche (the Argentinian side of the Andes) she tells us, to see 'glaciers, volcanoes, crystal clear rivers and turquoise lakes!' All the best for the year ahead George, we wish you well!



Sabrina Chesterman (DES Hons 2007)

Sabrina is currently doing her Masters at Oxford University, UK. She is based in the Environmental Change Institute and hopes to be finishing up her MSc in Environmental Change and Management in a few months.





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