

Editor's Note



Welcome to this issue of Grassroots!

Why is writing important? How are scientific and technical articles to be written? Writing remains the key medium of communication and the link between initial conceptions, plans, execution, outcomes, experiential learning, and the next project. The first feature article in this edition focuses on concepts which are important to consider when writing scientific and technical articles. The second feature article of this issue provides facts and figures of sustainable food production. The importance of research and development outcomes on this is conveyed in advances in agricultural science and technology having contributed to remarkable increases in food production since the mid-twentieth century.

This issue is also packed with news snippets relating to the fields of grassland science, and has a special focus on young grassland scientists. Reports on carbon credit plan aims to save Kenyan trees and elephants as well as the current status of South Africa's water resources are, amongst others, included in this issue.

The 49th Annual Congress of the GSSA was, as always, most successful. Congratulations to the Organizing Committee for a job well done!

Pieter Swanepoel

Carbon Credit Plan Aims to Save Kenyan Trees and Elephants - and Help Villagers

Carmen Russell-Sluchansky
National Geographic

The three-week-old carcass in Kenya's East Tsavo National Park is hardly identifiable as an elephant anymore. Gone are the hallmark tusks and expressive trunk; the elephant's entire face has been hacked off.

The perpetrators used a machine gun, said Eric Sagwe, who leads a private anti-poaching patrol in the park, pointing to bullet-scarred trees and the remains of two more elephants nearby. "For 30 years, this elephant was taken care of," he said. "Then someone comes and kills it in just a few minutes. I'm very sad to see this." (Related: "Beloved African Elephant Killed for Ivory—'Monumental' Loss.") The words on Sagwe's uniform, Wildlife Works, are an abbreviation for Wildlife Works Carbon, Inc., a company based in the Kasigau area of southern Kenya, where hundreds of elephants still roam. Sagwe is one of the company's 140 "wildlife rangers." He hopes the ranger ranks will continue to grow, but that will depend on whether his employer can sell enough carbon credits on the international market to sustain the Kasigau Corridor Carbon Project, as it's known.

The concept of carbon emissions trading, involving carbon "credits" as an economic incentive, was laid out in the UN's Kyoto Protocol, an international treaty

that came into force in 2005 to help mitigate climate change. Under the protocol, caps were placed on the greenhouse gas emissions industrialized countries were permitted to emit. Those that exceeded their limit, however, could buy "credits" from other member nations whose emissions fell below their target levels. The concept was extended to private companies (and even individuals), which could earn credits for reducing their carbon emissions by engaging in sustainable practices such as using solar power instead of coal or gas or protecting trees. Carbon emitters could buy those credits on a voluntary carbon exchange market to offset their own pollution.

Kasigau and Carbon Credits

Works's Kasigau project is the country's pilot carbon offset initiative. The Wildlife Works rangers monitor more than 500,000 acres of wooded land in the Kasigau Corridor—a stretch between Tsavo East and Tsavo West national parks containing more than 110,000 inhabitants—to prevent illegal tree-cutting and keep elephant poachers at bay. David Antonioli, head of the Verified Carbon Standard (VCS), the organization that sets rules and procedures and awards carbon credits, said those involved in the Kasigau project "are really pioneers. Not until this project came on

board did anyone have any good examples [to] point to and say, Here's how it works." Villagers hired by Wildlife Works count trees in the corridor, and the total amount of carbon stored in them is then calculated. Although the company self-reports this information, VCS carries out field audits (through another company, Environmental Services, Inc.) before issuing credits. Thus far, the project has been assessed as worth more than 1.2 million carbon credits, known as Verified Emission Reductions (VERs), each year over the past five. During that time Wildlife Works claims that deforestation has been reduced to nil. The company sells its carbon credits through the Markit Registry to corporate customers and banks, including Microsoft, Coca-Cola, Hershey's, Barclays, Allianz, and BNP. According to Wildlife Works VP, Rob Dodson, the total annual revenue from these transactions has ranged between \$3.5 million and \$7 million. In addition to the rangers, Wild Works's nearly 400 employees include horticulturalists, carpenters, seamstresses, mechanics, and teachers. A third of the carbon credit revenue goes to staff salaries and other operating costs. Another third goes to community landowners to compensate them for not exploiting Kisagau's natural resources for profit.

Community Benefits

The final third is split between investors and so-called carbon committees to be used for projects that benefit area communities. The committees determine what projects to undertake, prioritizing them by need and feasibility. "So many people have problems with water, so water projects—water tanks, water pipelines—

always come first," said Paschal Kizaka, a local chief and committee board member. "Now people do not have to walk for miles to carry drinking water back to their homes. Education is another major focus. More than 2,500 students have received carbon-funded scholarships for secondary and university schooling, and some communities have used their funds to build schools and equip classrooms with desks and learning materials. "The children were learning outside," said Ngare Duncan, who heads one committee. "And some children had to walk to school over eight kilometers that was infested by wildlife." Some money is used for training women to make eco-responsible household materials, such as natural soap.

Can the Project Be Replicated?

"The real value of [Kisagau] is it shows what can be done to fight climate change and eradicate poverty, as well as stop poaching," said Tim Christopherson of the United Nations Environment Programme, noting that the factors here were "just right" for success. "[Wildlife Works] has been in that area for years, so they know the local community, and they trust each other." Because Kisagau is a dry region that lacks the natural abundance of, for instance, the Congolese or Amazon rain forests, where people tap the resource base for profit, most village communities have opted in. Perhaps the biggest challenge to Wildlife Works's profitability—and, for that matter, its very survival—is the future of the voluntary carbon market. With the expiration in 2012 of key provisions of the Kyoto Protocol, and the inability of national governments to come to

an agreement on acceptable levels for greenhouse gas emissions, demand for carbon credits has fallen.

And, Christopherson pointed out, despite Kasigau's worthy accomplishments, the project is a small-scale effort at limiting greenhouse gases—"peanuts," as he put it. "We need to figure this out on a global level," he said. "There's a limit to how much we can use exchanges to offset emissions. If industrial emissions aren't capped, it doesn't matter if you were to protect even all of the Amazon."

**"Works's
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CSIR completes vital report on South Africa's water sources

Press Release

South Africa's investments in the construction and maintenance of engineered water infrastructure will be undermined in the long run if we do not protect the limited ecological infrastructure that provides us water. This is the caution from the recently released report titled 'Defining South Africa's water source areas', which maps South Africa's key water sources. The study was conducted by scientists from the CSIR in collaboration with the Global Environmental Facility (GEF) and the Worldwide Fund for Nature (WWF). It found that only 8% of South Africa's land area supplies a staggering 50% of the river run-off, which supplies major dams and drives economic activity in the country.

Dr Jeanne Nel – the main author of the report and a CSIR principal researcher in biodiversity and ecosystems – describes this finding as an important wake-up call for South Africa to prioritise water security in the country. "This report is part of our commitment as the CSIR to develop research solutions to improve water quality and quantity, and promote water security for our water-scarce country. By managing this tiny fraction of our land well, we can greatly improve our chances of building a secure water future," Nel remarks. Launched in Cape Town by Mohammed Valli Moosa – the former minister of Environmental Affairs and Tourism

and current director at Sanlam Limited – the report outlines the importance of these areas as sources of water in South Africa. It provides an assessment of key land uses in each of the source areas to use as a foundation towards developing strategies for sustainable land use practices.

The report highlights the availability of fresh water as one of the major limiting factors to South Africa's development. It calls for urgent action to protect the ecosystems that support healthy water resources, eliminate water wastage and ensure usage of water in the most efficient and effective ways possible. South Africa's water's sources are inconveniently located away from the centres of major industry, and tied to seasonal cycles. Deterioration of water quality and quantity in these areas can have a disproportionately large negative effect on the functioning of downstream ecosystems and the overall sustainability of growth and development needs of the country. "The importance of managing this small fraction of land that contributes so vitally to our water security should not only be acknowledged, but prioritised at the highest levels across all sectors. Currently, only 16% of our water source areas are formally protected and we should move fast to ensure that this percentage is significantly increased through management agreements with private land owners," says Nel.

“The maps released in the report were based on systematic and expertly reviewed scientific data collected over decades from rainfall and flow gauges across the country,” says Janis Smith, CSIR researcher and co-author of the report. “The catchment areas we identified through these data are the key drivers of economic development as they supply water to the majority of the country, including economic hubs, farms and industrial facilities. We need to act now to ensure that the right measures are in place to protect them. We need to focus on our water source areas if we are to create a legacy for water security,” continues Smith.

Other key issues highlighted in the report include the risk posed by coal mining in the Ekangala and Mpumalanga Drakensberg source areas and the success story of the headwaters that feed the Berg River Dam. “The Berg River Dam’s success proves that deliberate efforts in managing and protecting key catchment areas can achieve positive results for downstream users. This area, previously covered in alien invasive vegetation, has been cleared and natural fynbos has been restored. The landscape is now more resilient to fires, floods and drought and delivers good quality water to the dam,” concludes Nel.



Ecological restoration at Sendelingsdrif

Cracking the habitat code of the critically endangered *Juttadinteria albata* succulent

Lineekela Nauyoma

The snow white flowers in the Sendelingsdrif area, *Juttadinteria albata*, are very rare and occur exclusively in a small area centered on Namdeb's new Sendelingsdrif mine. So small and vulnerable is the population of this species that it has been accorded the highest 'Critically Endangered' conservation status in the red data book of the International Union for Conservation of Nature (IUCN), a status paralleled by species such as the black rhino. Namdeb's mining operations at Sendelingsdrif will inevitably strip away areas of *Juttadinteria albata* habitat in the on-going search for diamonds.

Following mine closure the mining areas will be restored to allow plants and animals to thrive again but recreating the habitat for *Juttadinteria albata* will not be easy.

Although it is able to germinate in a greenhouse, it seems that *Juttadinteria albata* has very specific growth requirements in nature, which may be the reason for its small distribution range.

To assist with the successful restoration of the *Juttadinteria albata* population at Sendelingsdrif, an experiment was initiated in January 2013 on site by Namdeb. This initiative is supported by the University of Namibia and Gobabeb Research and Training Centre. This so called 'heap' experiment consists of twelve heaps (5m in diameter) spaced about 15m apart. It is made up of a mixture of waste materials that will be similar to the materials eventually used for back-filling mined areas.

The main objective of this experiment is to understand which slope angle, aspect and amount of rockiness *Juttadinteria albata* prefers in order to recreate its habitat during restoration and in addition to choosing spots best for transplantation or the sowing of seeds.

To see the beautiful white flowers of *Juttadinteria albata* where once there were excavations, will be a great victory for responsible mining.

“Following mine closure, the mining areas will be restored to allow plants and animals to thrive again but recreating the habitat for *Juttadinteria albata* will not be easy.”



The participants in the restoration ecology heap experiment. From left to right: Joyce Katjrua, Liezl Maritz, Elizabeth Nakathingo, Alfues Shekunyenge (MSc student, University of Namibia), Sivanus Kaulwa, Hireeka Nauyoma (MSc student, University of Namibia), Cherilee Fortuin, Ursula Witbooi and Ferdinand Mwapopi. Absent: Dr Cornelis van der Waal (Gobabeb Research and Training Centre)

The EWT Launches a Roadkill Mitigation Project in the Pilanesberg National Park

Press release
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The Endangered Wildlife Trust's Wildlife and Transport Programme (EWT-WTP) has launched a new project which aims to reduce animals killed on roads in National Parks. Pilanesberg National Park in North West Province is the first South African park to support the initiative. Pilanesberg is the third most frequented park by international and national visitors alike, and is managed by North West Parks and Tourism Board. The Park is unique in that it occurs within the transition zone between the dry Kalahari and wetter Lowveld vegetation, commonly referred to as "Bushveld". Thus it has a rich diversity of birds, mammals and plant species.

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wetter Lowveld vegetation, commonly referred to as "Bushveld". Thus it has a rich diversity of birds, mammals and plant species.

"During last week's surveys in the Pilanesberg I found 23 dead animals on the road including terrapins, snakes and rodents. There were also a number of frogs and birds, which were unfortunately too squashed to identify accurately to species level. From work already conducted, we know that roadkill peaks between January and April in South Africa when migratory birds are present, and reptiles, amphibians and mammals are more active. I was not expecting to find as many casualties of roads as I did in the month of May," said Collinson. "We also conducted approximately 234 questionnaire surveys during our May visit, 181 of which were visitors from South Africa, with the remaining 23 from overseas. Twenty-seven respondents declined to participate in the survey. Of the surveys, 141 said that they had noticed roadkill outside of protected areas, whilst only 19 said that they had seen roadkill in national parks. These included tortoise, birds, snakes, and even a rhino."

Interestingly, when asked to define what roadkill is, many people considered roadkill to only be wildlife and not livestock. Fifty-four people did however mention invertebrates such as moths, butterflies, and dung beetles, and said that these were also at risk from vehicles. 141 respondents further said that they had experienced roadkill first hand, whilst 66 said that they had never hit an animal on the road. However, further questioning revealed that many people did not consider smaller species such as frogs and rodents to be a roadkill, possibly because they did not cause damage to the vehicle or are too small to be noticed on the road. This highlights a likely under-reporting of data being submitted by the public, and more public awareness is needed to highlight that ALL species have the potential to be affected by vehicles on roads. The EWT-WTP has started analysing the questionnaires in detail and will be able to provide further details once this process is complete.

“Some of the less obvious impacts of roads is that they often fragment habitat, which restricts animal movement and increases the isolation of populations. In addition to altering animal behaviour, some animals are attracted to roads. For example, snakes and other ectotherms habitually bask on tar roads, and some birds consume spilt grain from roadside vegetation. Similarly, antelope and other browsing herbivores are attracted to the dense vegetation or so called ‘green curtain’ of roadside edges. This attraction often exposes them to increased risk of being killed by vehicles. Some species avoid roads altogether and may shift

home ranges, feeding sites and nesting areas away from the roads,” continued Collinson.

The EWT-WTP will be back in Pilanesberg in October 2014 to conduct more roadkill data collection and questionnaires. Visitors to parks are encouraged to become citizen scientists by contributing to the research. If, during your travels, you spot any roadkill on our roads please record your sighting via our cell phone app, Road Watch South Africa, and the EWT-WTP will use the data you share in their work to reduce the impacts of transport on our wildlife. The app has been designed to simplify data collection. Just with a click of a button you will send us a photo of the incident, as well as the date time and GPS co-ordinates. To take part simply type this link into the Safari browser on your Android platform phone:<http://www.prismsw.com/roadwatch/androidRoadWatchSouthAfrica.apk>. The app is also available Apple – simply search for Road Watch.

Thanks to Pilanesberg National Park, Copenhagen Zoo and Bridgestone South Africa for supporting the initiative. Thanks too to the citizen science volunteer network and Africa:Live, iSpot, Pilanesberg Honorary Officers and Makanyane Volunteers. For further information please contact Wendy Collinson on wendyc@ewt.org.za or Claire Patter-son-Abrolat on clairep@ewt.org.za



Dead or Alive? Comparing Costs and Benefits of Lethal and Non-lethal Human–Wildlife Conflict Mitigation on Livestock Farms:

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Abstract: Livestock depredation has implications for conservation and agronomy; it can be costly for farmers and can prompt retaliatory killing of carnivores. Lethal control measures are readily available and are reportedly perceived to be cheaper, more practical and more effective than non-lethal methods. However, the costs and efficacy of lethal vs non-lethal approaches have rarely been compared formally. We conducted a 3-year study on 11 South African livestock farms, examining costs and benefits of lethal and non-lethal conflict mitigation methods. Farmers used existing lethal control in the first year and switched to guardian animals (dogs *Canis familiaris* and alpacas *Lama pacos*) or livestock protection collars for the following 2 years. During the first year the mean cost of livestock protection was USD 3.30 per head of stock and the mean cost of depredation was USD 20.11 per head of stock. In the first year of non-lethal control the combined implementation and running costs were similar to those of lethal control (USD 3.08 per head).

However, the mean cost of depredation decreased by 69.3%, to USD 6.52 per head. In the second year of non-lethal control the running costs (USD 0.43 per head) were significantly lower than in previous years and depredation costs decreased further, to USD 5.49 per head. Our results suggest that non-lethal methods of human–wildlife conflict mitigation can reduce depredation and can be economically advantageous compared to lethal methods of predator control.

The full article is available at <http://journals.cambridge.org> and could be cited as: Mc Manus, J. S., Dickman, A. J., Gaynor, D., Smuts, B. H., & Macdonald, D. W. (2014). Dead or alive? Comparing costs and benefits of lethal and non-lethal human–wildlife conflict mitigation on livestock farms. *Oryx*, 1-9.



Tropical Grassy Ecosystems Under Threat, Scientists Warn

Catherine L. Parr, Caroline E.R. Lehmann, William J. Bond, William A. Hoffmann, Alan N. Andersen.

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Scientists at the University of Liverpool have found that tropical grassy areas, which play a critical role in the world's ecology, are under threat as a result of ineffective management. According to research, published in *Trends in Ecology and Evolution*, they are often misclassified and this leads to degradation of the land which has a detrimental effect on the plants and animals that are indigenous to these areas.

Tropical grassy areas cover a greater area than tropical rain forests, support about one fifth of the world's population and are critically important to global carbon and energy cycles, and yet do not attract the interest levels that tropical rainforests do. They are characterised by a continuous grass understorey, widespread shade-intolerant plants and the prevalence of fire, which all generate a unique and complex set of ecological processes and interactions not found in other habitats. Dr Kate Parr, from the School of Environmental Sciences, said: "The distinctive evolutionary histories and biodiversity values of these areas needs to be recognised by conservation managers and policy makers. "Whilst it is generally assumed that 'more trees are better' in tropical rainforest this

is not necessarily the case for tropical grassy ecosystems and so the outcomes of global carbon and conservation initiatives, which include the UN's Clean Development Mechanism and its Reducing Emissions and Deforestation Forest Degradation schemes, need to be better considered when they are applied to tropical grasslands. "Any changes to the balance between human livelihoods and ecosystem function would have an impact on the use of land, the availability of resources and would affect the way the land functions including its climate. "The vast extent of tropical grasslands and the reliance of human welfare on them means that they deserve far more research and conservation attention than they currently receive."

Approximately 20% of the world's population depend on these areas of land for their livelihoods including their use for grazing, fuel and food. They also store about 15% of the world's carbon. Tropical grassy ecosystems are associated with savannas and upland grasslands in Africa and savanna-type grasslands in India, Australia, and South America, representing diverse lands from open grassland through to densely canopied savanna.



Rare Honour for SAEON Scientist

Press Release

SAEON's Chief Research Scientist, Prof. William Bond, has been elected a foreign associate of the United States' National Academy of Sciences, an honour conferred on the world's best scientists by their peers.

The National Academy of Sciences is an independent, non-profit society, established by an Act of the United States Congress in 1863. It is regarded as one of the top academies in the world. Its task is to provide independent, objective advice to the US government on matters related to science, engineering and medicine. Nearly 500 of its 2 214 members and 444 foreign associates have won Nobel Prizes. Foreign associates are non-voting members. Only 21 foreign associates are elected annually, based on an extensive vetting process that results in a final ballot at the academy's annual meeting in April every year.

Highly cited researcher

In addition, William has just been notified that he has been selected as a Thomson Reuters Highly Cited Researcher, one of only six South African scientists to receive this accolade. As a member of the Highly Cited Researcher list, he is also included in the "2014 The World's Most Influential Scientific Minds."

Top-rated scientist

William Bond is one of South Africa's top scientists. He is an ecologist with broad interests in the processes most strongly influencing vegetation change in the past and present, including fire, vertebrate herbivory, atmospheric CO₂ and climate change. In addition, he has worked on plant-animal mutualisms and on plant form and function. Particular research interests include grasslands and savanna ecosystems, and winter-rainfall shrublands.

William has served on the Boards of the South African National Botanical Institute and Cape Nature, and on the editorial boards of several journals. Among his achievements he authored and co-authoring nearly 200 papers and three books. Describing these latest achievements, William said he was "very pleasantly surprised. It is easy to think you are on the fringes on things in Africa. Recognition by the National Academy of Sciences is an extraordinary affirmation of the relevance of ecological studies in Africa to the wider world of science." The CEO of the National Research Foundation, Dr Albert van Jaarsveld, joined SAEON and the South African research community in congratulating William: "It is a tremendous honour for any South African scientist to be elected a foreign associate of the US National Academy of Sciences," he said.

"I would like to congratulate Professor Bond on this extraordinary and well-deserved achievement. William has been an inspiration to many young ecologists, especially here at home for many years. It is therefore particularly gratifying to see his contributions also being recognised by our international peers.

"As an NRF A-rated scientist, William recently joined the South African Environmental Observation Network (SAEON) as its Chief Scientist. We expect that his inspirational career and leadership will enthuse young scientist working on the SAEON platform to emulate his achievements over the coming years."



William on stage during the signing ceremony of the United States' National Academy of Sciences, of which he has been elected a foreign associate



William is passionate about passing his knowledge on to the next generation of scientists



The Camp that Trains Would-be Scientists

Joe Sibiya
Education Outreach Officer
SAEON Ndlovu Node

The SAEON Ndlovu Node's annual science camp for learners is the flagship initiative in the node's science education programme. Each year the camp provides an opportunity for specially selected grade 9-11 learners from local high schools in the Phalaborwa region to participate in the environmental science education learning experience. Learners on the camp are exposed to scientists who engage them in intensive structured, small-scale research projects aimed at stimulating their scientific knowledge and skills and promoting teamwork. In addition, learners are introduced to diverse careers in environmental sciences and afforded the opportunity to complete career portfolios with the objective of guiding them in setting career goals for themselves, as well as identifying their abilities and career interests. A group of 14 learners participated in the fourth grade-10 science camp held at Silver Mist Resort at Haenertsburg in the Limpopo Province in April 2014. The theme for the camp, "Biodiversity - comparison and contrast", served as inspiration for the learners as well as for participating scientists. The overall objectives of the camp were to strengthen the learners' scientific thinking by encouraging and enabling them to develop and complete their own scientific projects, and to evaluate personal skills and goals in the light of future career choices.

Sampling the habitats

Early the next morning staff members Sharon Thompson and Thobile Dlamini (Grassland), Dr Dave Thompson and Thabo Mohlala (Forest), and Thembi Marshall and Joe Sibiya (Plantations) led the teams to the study sites to begin the hard work of sampling the habitats. Each team diligently collected data at the respective sites. They were also expected to determine the different life forms occurring within the respective habitats.

Analysing the data

Later that afternoon it was time for the would-be scientists to start analysing their data and preparing posters for presentation the next day. It was inspiring to witness grade 10 learners taking control of their learning. The teams showed some insight into, and understanding of scientific methods by applying scientific method procedures in their research projects.

Presenting the research findings

On the final day, the teams presented their research findings. The research results of the Grassland team showed that while no trees occurred in this habitat, there was a multitude of other species like birds, insects and forbs other than grass.

This was contrary to the early observation that only grass occurred in the grassland habitat. The results of the Plantation team showed that plantations are unnatural, consisting of the same type of tree species planted in rows. The results were consistent with the early observation made that trees in plantations were evenly distributed. The team found other life forms like moss and invertebrates in the plantation. The Forest team's research results indicated a mix of grass and forbs, and a combination of tall and short trees in this habitat. They also found different types of insects and birds in the forest.

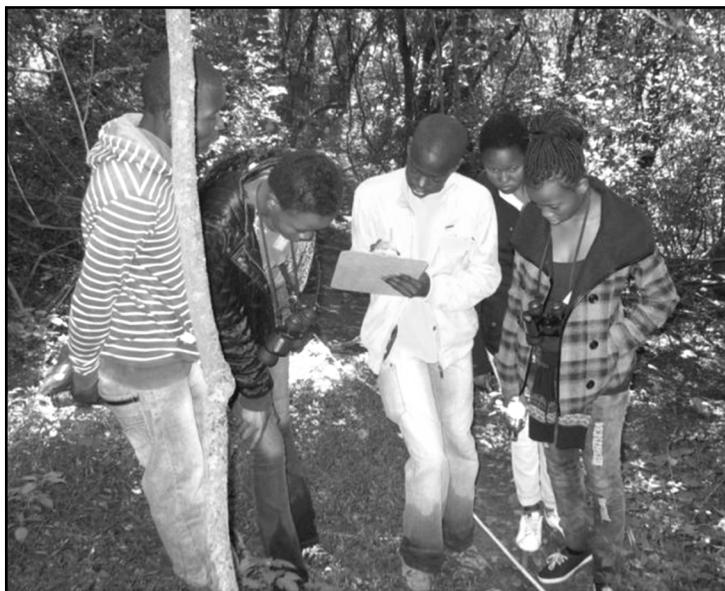
The presentations culminated in a lively debate based on the research findings as to which habitat was more important. The Grassland team argued that their habitat was more important than the others because it provides grazing for cattle and offers a home to terrestrial insects and birds. The Forest team defended their habitat by saying it promoted biodiversity. The Plantation team presented their case that this habitat was more important based on its economic value. Finally, a consensus was reached that all the habitats were important and that all of them needed to be conserved.



The intrepid Grassland team tackle their project with gusto (Picture: Sharon Thompson)



Grassland team members search for invertebrates occupying this habitat (Picture: Sharon Thompson)



Members of the Forest team collect data using a quadrant at each 15 m on a 30-m transect (Picture: Dave Thompson)