



TRANSFRONTIER AFRICA

Annual Report

2023

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Black Mamba Anti-Poaching Unit

Bush Babies Environmental Education and Awareness Program



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PART A – SECURITY & BLACK MAMBAS

1. Snare detection and illegal human activities

Any prohibited activity within the park is considered illegal, which includes, but is not limited to, the removal of vegetation or plant material without a permit, the removal of animals or animal products, or the intentional trespass to commit a crime (e.g., poaching, snaring, robbery). To control these risks and discourage trespassers, the Black Mamba Anti-Poaching Unit (APU) prioritises patrolling areas considered to be at high risk of illegal human activity. These are usually areas with large numbers of temporarily employed personnel (e.g., construction sites), easily accessible areas with a low risk of detection and/or obvious escape routes, areas that were previously poorly patrolled, or areas with key resources that attract a higher concentration of animals, such as a waterhole.

The main form of illegal human activity reported in OWRN and BOCCA is snaring, i.e., the intentional trespassing and setting of wire or cable snares to catch game. Indeed, snares are commonly used by poachers to capture wild animals for muti (traditional medicine) or bushmeat, as their use is low risk for poachers who can set them quickly, limiting the risk of being caught. Made from wire or cable, attached to a tree in the bush and characterised by a deadly noose, snares are non-selective weapons that trap and kill or injure any animal that passes through them. This implies that non-target species, such as wild dogs, hyaenas, elephants or hippos, are also affected by this threat, which can result in injuries, loss of limbs or death. This threat is compounded by the fact that poachers sometimes forget the location of snares that have not caught animals during initial checks, leaving snares in the landscape long after they have gone. To control this ongoing threat, the Black Mamba APU conducts daily snare sweeps in both OWRN and BOCCA and monitors areas where snares have previously been found to remove any potential new ones. By covering the landscape in such a way, they gather information on snaring hotspots and high-risk areas, such as the vicinity of building sites, where the movements of construction workers are also regularly monitored.

In 2023, the Black Mambas have been revisiting old snaring hotspots as well as following up on new areas identified as being at risk of having snares, and a total of 141 snares were removed from OWRN and BOCCA collectively.

Table 1. Number of snares detected per team, according to their operational status (set/not set) and age (fresh/old) when found, in 2023.

Team	Set in position			Not set in position			Unknown			Total
	Fresh	Old	NA	Fresh	Old	NA	Fresh	Old	NA	
Golf1	1	1	5	1	23	12		1	1	45
Golf2	1	1			4					6
Armed response	1	16		2	15					34
Oscar1	4	6	1		10	3		1		28
Oscar2	10	13	2	2	2	1	1			33
Total	17	37	8	5	54	16	1	2	1	141

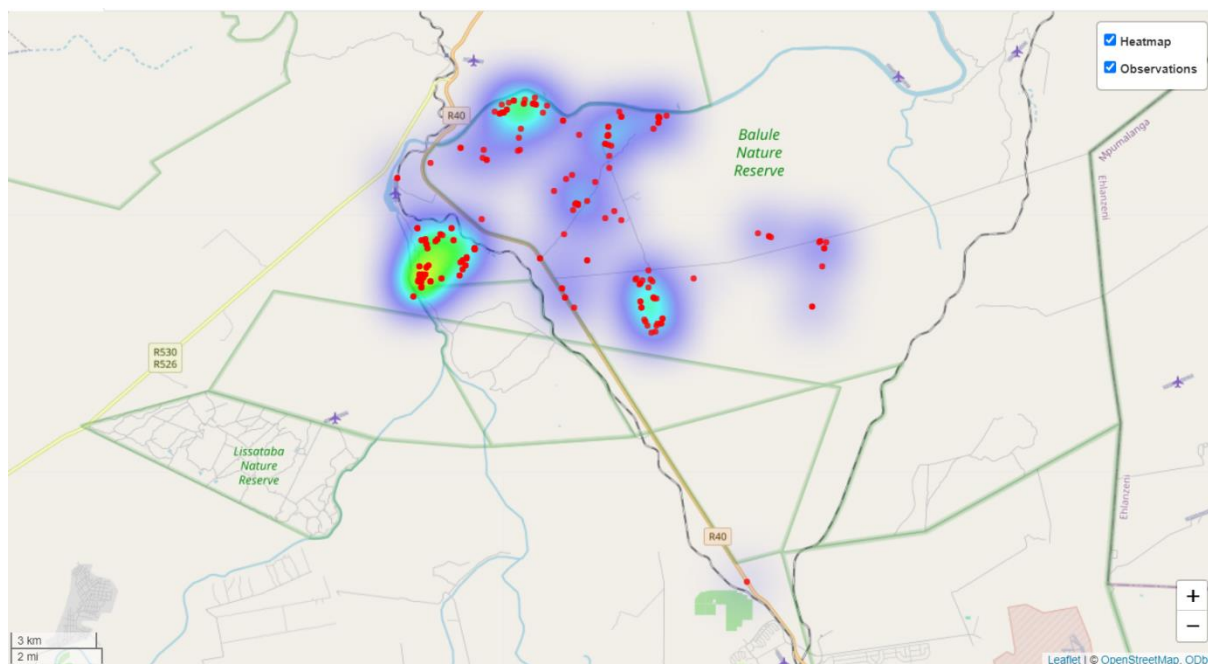


Figure 1. Location of snare removed by the Black Mamba APU and patrol density in OOWNR, BOCCA and the bufferzone in 2023.

2. Patrols

The Black Mamba teams patrol OOWNR and BOCCA daily to ensure early detection of any security breach, prevent illegal human activities and animal escapes, and gather information used by the command-and-control centre for record keeping, potential further investigations and predictions to prevent poaching and the arising of future security issues. Daily patrols are planned to proactively secure our landscape, following a disruptive model rather than a model relying on reactive resources. To do so, the Black Mambas cover the critical window where poachers attempt to enter or leave the reserve, often at first light or sunset. By closing this window with patrols, we are able to reduce the risk of poachers entering the landscape undetected.

Every morning, a team patrols the western fence of OOWNR to detect any human tracks, signs of intrusion or animal escape (Figure 2). This patrol is carried out at first light on foot, as this has proven to be the most effective way to detect tracks and signs. The other two teams conduct snare sweeps in areas selected by the command-and-control centre based on historical and latest information.

In the evenings, a team patrols the western fence of OOWNR on vehicle, primarily for security reasons, but also because driving a marked vehicle along the fence disturbs the landscape, indicating to poachers or criminals that they will not be able to enter the landscape undetected. A second team is posted at observation points to listen for and spot any unusual activity (e.g., spotlights shining, vehicles moving in areas where they should not be, gunshots). This constitutes a second level of detection. The observation posts are located in areas that provides a good view of the landscape and allows for easy detection of gunshots. Finally, a third team patrols the servitude roads and

focuses on observation posts in high-risk areas, such as building sites or areas where night-time movements of personnel are frequent.

Patrol efforts have increased to cover more of the landscape with staggered patrols, which ensure that we are able to disrupt as large portion of the landscape as possible while detecting any illegal or suspicious activity (Table 2 and Figure 2). During the full moon phases, we have a total of 5 teams out on patrol, saturating the landscape in the highest risk period of the month. As we approach December and the festive season, our patrol efforts will adapt even more to saturate the landscape in areas where poachers might attempt to enter the reserve. Figure 2 shows that the patrol density is much higher in the western section of the reserve due to the high risks that the R40 represents. As well as the areas where rhinos were most recently seen and reported, the Mambas will go out and observe and stay close to the asset to ensure their safety but also as a deterrent to poachers (Figure 2). This proactive method has proven to be most effective.

The Mambas have patrolled the fence every day for the year of 2023, with bad weather the drive the fence to ensure the fence is still covered, while at the same time ensuring the Mambas safety. Every night a minimum of two vehicles were out on patrol to ensure all risk areas and assets are covered. The Armed Response team has responded to numerous call outs to support Mambas with compound Searches, Sting Operations, and apprehension of poachers on neighbouring reserves, with a total of 1066 hours spent in the field for 2023. The Crime Prevention Unit has covered 3286 Kms throughout the year, mainly focusing on snare sweeps, compound searches, roadblocks and fence patrols on BOCCA. Golf 1 And Golf 2 have done a total of 943 patrols in total for 2023, focusing most of the efforts on patrolling the East of OWRN as well as visiting building sites on OWRN. Oscar 1 and Oscar 2 comprises of the Mambas who Live at the Ekuthuleni Mambas HQ have covered an impressive total of 25908 kms in the new vehicle which they got a year ago, with their main focus point being the OWRN fence and securing the Western Section of OWRN (Table 2).

Table 2. Length (km) and duration (hours) of patrols per type of patrol and per team in 2023.

Patrol type	Length/ Duration	Golf 1	CPU	Oscar 1	Oscar 2	Golf 2	Total
Foot patrol1	Km	1117.7	1032.16	2136.9	546	310	5142.7
	Hours	501.7	390.78	623.2	81	225	1821.7
Vehicle patrol	Km	5547.7	229.27	9242.1	1326.5	686	17032
	Hours	1548.6	69.15	1264.5	245.9	154.4	3282.5
Snare sweeping	Km	752.6	816.25	505.8	377.4	277	2728.9
	Hours	384.5	628.67	363.6	185.7	160.6	1723
Search	Km	121.4	891.76	122.8	470	49	1654.9
	Hours	25.4	287	43.5	62	10.8	428.7
Total	Km	47468.7	2969.4	12007.5	2738	1321.9	26558.5
	Hours	2460.2	1375.6	2294.8	574.6	550.8	7255.9

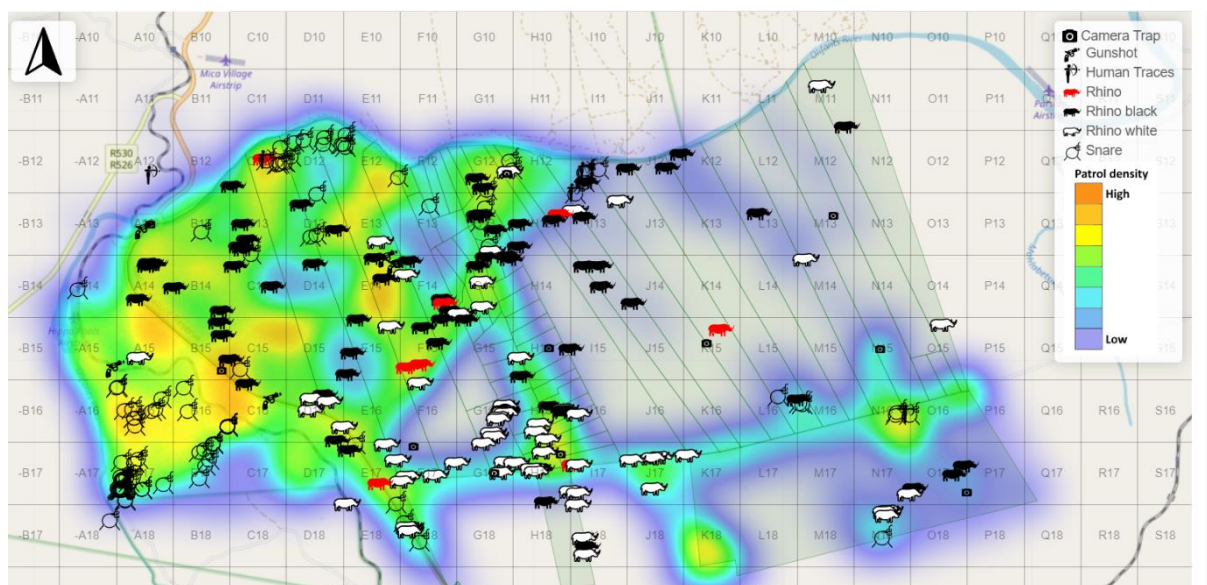


Figure 2. Patrol density, illegal activities and rhino sightings in 2023.

3. Black Mambas - updates

In the past year we have had some additions to The Black Mambas, such as the CPU team who are operating full swing as an Ad-hock team, that targets snared areas and routine vehicle and compound searches as well as fence patrols on Ekuthuleni. Two Mambas have completed leadership and Ranger leadership courses at the Wildlife College, and two Black Mambas have completed their Eco Training course where an additional Two Mambas are currently completing their Eco training course. Two Mambas have been trained to work in the Operations Room as Standby Ops Commanders. The Armed Response of the Black Mambas was trained for tactical movements and shooting, and an additional armed response member is being trained. The Black Mambas community involvement with Farmwatch has also increased. A new electric vehicle has been given to the Mambas and tests are to be run with it. New Epaulets Designed by Jay Vanny have been issued out. Black Mambas received a “Stop The Bleed” refresher course with Wild Response.

4. Animal welfare operations

On the Animal welfare front we have been lucky with very few incidents, most recent incidents being an injured wild dog that looked like it sustained its injuries naturally, we were unsuccessful with darting to treat it. We had a hyena with a snare around its neck on BOCCA and have continued to make attempts to find the animal but so far have proven unsuccessful, a Vervet Monkey with a baby who suffered from pneumonia on BOCCA, the black Mambas took the monkey to Provet animal hospital for treatment.

On March 3, 2023, the Black Mamba APU responded to an animal welfare emergency, and assisted veterinarians in locating a snared elephant in Impalabos West, OWRN. The elephant, originally from a neighbouring region, was darted, freed from the snare, and successfully relocated.

PART B – BUSH BABIES

The Bush Babies Environmental Education program is an education program that focuses on the conservation and preservation of our natural resources, both living and non-living, in the local communities that border the western boundary of the Greater Kruger National Park. It was established in 2015 and operates in four local communities.

The program works with members of different ages on different projects to achieve our objectives:

- To identify the problems within communities by improving locals' knowledge of these issues.
- To improve locals' knowledge and understanding of animal welfare through engagement and hands-on activities carried out as part of the donkey welfare project.
- To change behaviour through knowledge – engage with experts through lessons to change behaviour.
- To create champions and ambassadors in local communities through the SCOUTS movement.
- To give exposure and first-hand experiences through excursions and camps.
- To develop the skills of locals through training and employment.

“Creating the platform for the next generation to grow and mature in nature.”

1. Environmental Education – Bush Babies Program



Figure 1. Bush Babies troop members celebrating 8 years of the Bush Babies program in 2023.

The program selected 10 disadvantaged primary schools in the local municipality of Ba-Phalaborwa, Limpopo, with Grade 7 learners aged 13-14 years within four communities (Maseke, Mashishimale, Makhushane and Namakgale), where Environmental Education and Awareness lessons are conducted on a weekly basis for a duration of 30 minutes per lesson by our three education officers.

Our objectives throughout the year were: Information gain and behavioural change through the engagement with learners on the themes my environment, tree and water conservation and endangered species. Three teaching methods are used, the traditional method included concepts and background information on the topic. Learners are engaged in an active learning and discuss issues, the human impact and importance of the theme using visuals to enhance learning. The last method is the hands-on skills building which involved the learners in hands on activities such as clean-up campaign and tree walk throughout the year.

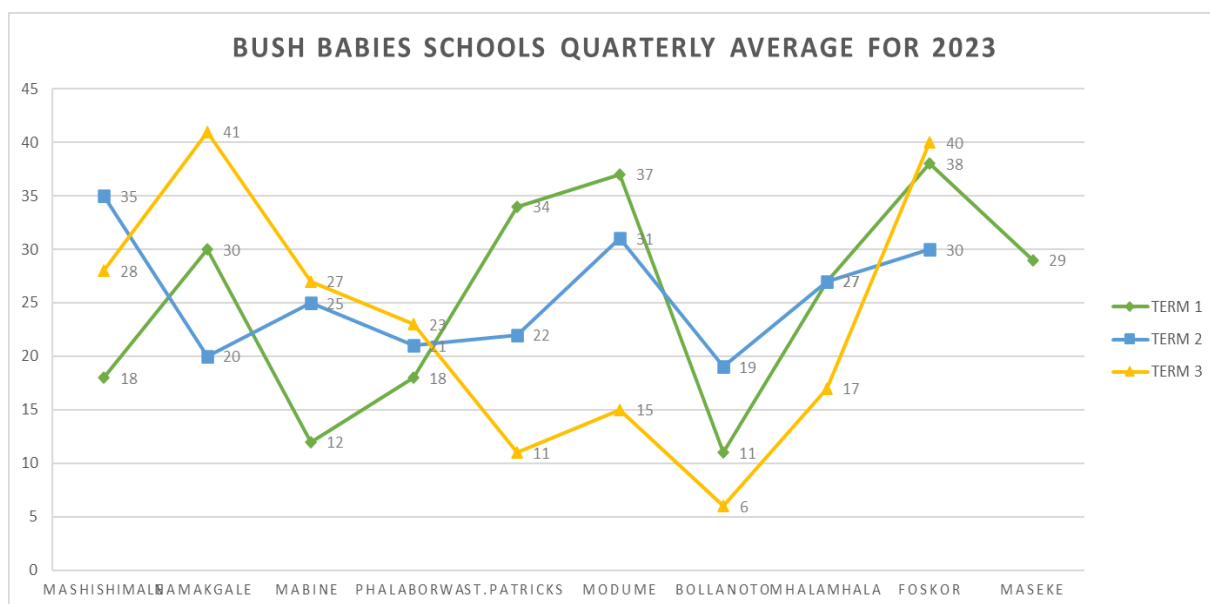


Figure 2. Bush Babies schools quarterly average for 2023.

In Figure 2 we looked at the average per school per term, Mabine and Phalaborwa primary improved and increased through the three terms. But all our schools performed poorly in comparison to the previous years. The average for all schools in term 1 was at 25.40% and increased by 0.13% in the second term, the third term dropped by 2.46%, giving an average of 23.07% and this was due to the change in the facilitation periods, instead of weekly visits the program was facilitated over 1-hour sessions twice a month, as compared to weekly visits of 30minutes sessions.

2. Scout Program

The Scouts program teaches its members to be independent, to take responsibility, to protect the environment and to contribute to their community while preparing them for success. The method and purpose of Scouting is education for life, fun for life and a

code for living. The aims are met through promises and laws, learning by doing, membership of small groups, and progressive and stimulating programs.

The Bush Babies program joined the World Scouts movement in 2019, initially admitting girls and boys aged 11-17 years (Scouts) and their siblings aged 7-10 years (Cubs) and began accepting 5- and 6-year-olds learners (Meerkats) from 2021.

The troop meeting is held every Friday at our resource centre in Maseke village for a duration of 90 min, so we had a total of 51 days throughout the year where learners participate in various advancement programs to learn skills and develop themselves.

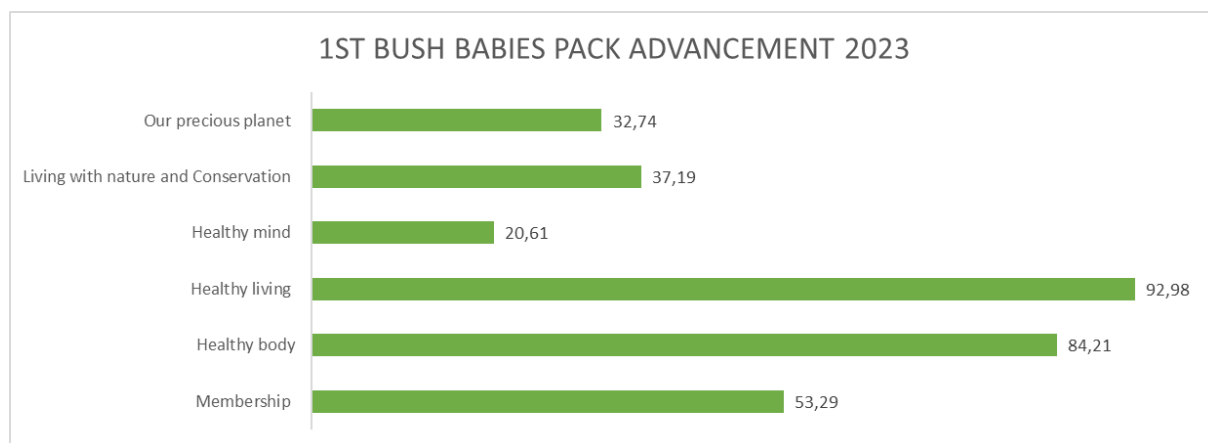


Figure 3. Bush Babies pack advancement for 2023.

The cub pack worked on their silver wolf badge after the completion of their membership badge under the awareness challenge (Figure 3). The cubs had a total of 92.98% which entailed basic health care such as washing of hands, importance of good eating habits and understood why it’s important to keep the body clean. Healthy body was second best as the cubs were required to do their best in pack meetings, eating healthy look after themselves and play with the ball while being assessed for the hand ball coordination.

Healthy mind was challenging for the cubs as it required and trained the cubs through sense and memory games and had to write and decipher a simple code. Our precious planet and Conservation had an average of below 38% as some requirements were not met, language was addressed as a contributing factor as most cubs cannot write and read in the English language. The troop did exceptionally well (Figure 4), from the membership the average was 74.47% where the troop learn about the scouts promise and law and the scouting background, they progressed to work on their traveller badge, where Scouts learn what it means to be a scout and learn new skills, scouts also learnt the basic knots and lashings, first aid and safety, how to live outdoors and an introduction to community service.

Within the traveller badge they worked on their adventure badge (51.11%) and did mapwork, compass and directions, and will complete this badge after they participate in the expedition and meet the requirements. For safety awareness (53.30%) badge they did general safety, emergency situations, safety awareness in water, dangers of fire, first aid, ground to air signals and drawing attention to self in an emergency.

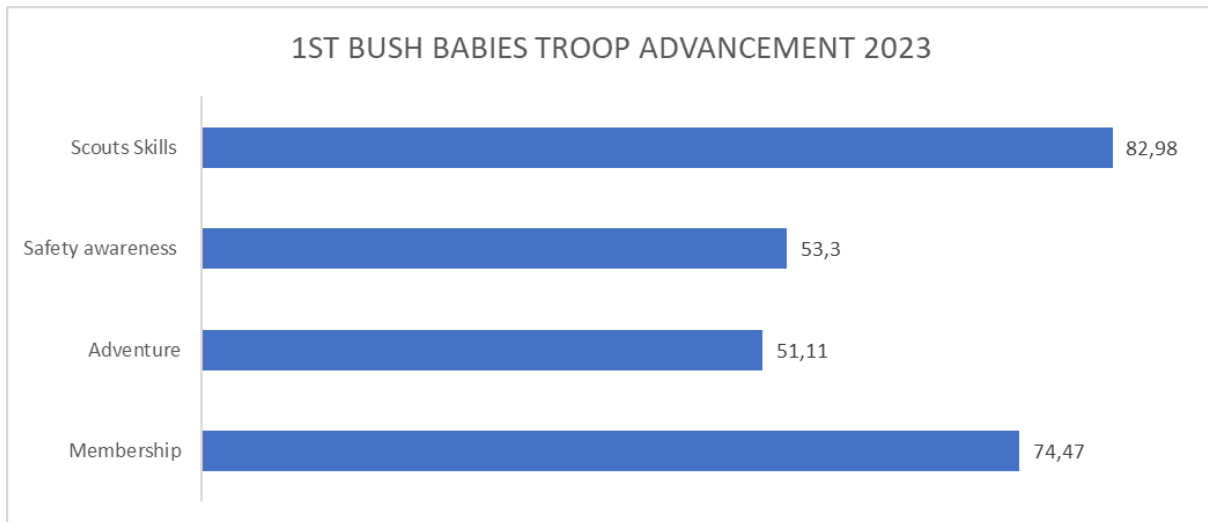


Figure 4. Bush Babies troop advancement in 2023.

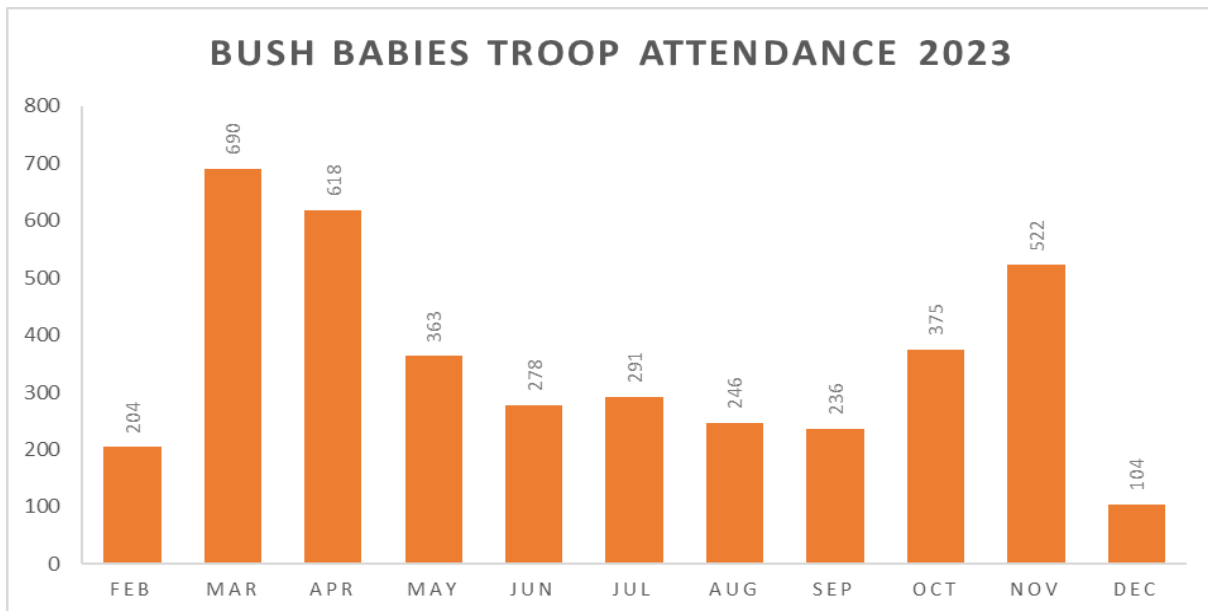


Figure 5. Bush Babies troop attendance in 2023.

In the first term we had 12 troop meetings with 894 learners 54.25% were Scouts and 42.72% were cubs, in the second term we had 15 troop meetings, 1259 attendees were 59.65% were scouts and 40.34% were cubs, the improvement on Scouts was motivated by the requirements on adventure where they had to recruit and introduce a friend to the scouts' movement. In the third term we saw a decline in the attendance of troop attendance and recorded 773 learners over 13 meetings the Scouts attendance was 59.24% and 40.70% were cubs, due to the third term being the last term for schools to take learners on excursions our learners missed the troop meetings. The last term was very short with 11 meetings we recorded 1001 troop members, 52.04% were scouts and 47.95% were cubs.

Overall, the troop had 51 troop meetings amounting to 4590 minutes spent learning new skills and improving their lives, a total of 1387 cubs and 2242 scouts were invested

into the movement in the 2023 academic year over a period of 11 months, excluding January where the team focuses on the paperwork (Figure 5).

The above data was included in the food security program where these learners were fed from the Kansas City Zoo with the March and April numbers doubled as we fed the troop twice (breakfast and lunch) during the school holidays. Our breakfast meal is soft brown porridge with milk (Figure 6), and the lunch varies weekly with meat (beef mince/ sausage and chicken), starch being either rice or pap and Samp in the winter months, and a salad or vegetable (coleslaw/ beetroot/cabbage/mash potatoes). We are grateful to Kansas City Zoo for the continued support with the food security where 5000+ children were fed.



Figure 6. Bush Babies troop members eating breakfast during the school holidays in 2023.

3. Bushgrannies program

The Bush Grannies programme was launched in 2016 after realising that learners had their own beliefs and understanding of wildlife, and that these were mostly passed on by their grandparents. Indeed, Bush Grannies play a crucial role in the up bringing of their grandchildren as their parents are working in the cities or looking for employment away from home.

In the olden days, the grannies would sit around the fire and share short stories with their children and grandchildren. Our main objective is to restore this indigenous knowledge and share it with local children through the Bush Grannies program.



Figure 7. Bush Grannies on a game drive at Kuro Camp in 2023.

In the 2023 academic year we partnered with Connected planet together with Kuro Camp where the 40 Bush Grannies and 40 granddaughters spent 3 nights and four days learning and teaching each other regarding wildlife, the teachings and engagements included understanding the myths and beliefs about specific indigenous trees, perception of the pangolin, lion, elephant, rhino went on morning and evening game drives to see the wildlife (Figure 7).

The expected outcomes of this excursion were information gain and change in their behaviour and how they perceived wildlife, share what was learnt together and learn more from people in the conservation field, especially the tour guide who shared the most valuable information. These camps were a success and allowed for the grannies to learn new insights and share it with the grandchildren.



Figure 8. Bush Grannies and Connected Planet friends in Kruger National Park, Skukuza.

In October our funders from Connected planet and their friends visited the Bush grannies and sponsored an overnight trip to Skukuza rest camp, we drove through the park with the aim to increase our sightings of wildlife, and we were fortunate to spot 4 of the big 5 species (elephants, 3 leopard sightings, lion and buffaloes). The group met at the viewpoint where they sang and danced as the sun went down (Figure 8), and

later in the evening sat together to dine at the restaurant were the grannies continued to share their experiences from the Kuro camp program with their grandchildren.

We would like to thank Connected planet for the sponsorship of these educational and benefitting camps, and we are happy that in the year 2024 they will still sponsor more camps.

4. Animal Welfare Program

The animal welfare initiative was launched in response to the data collected by the village patrol, which reported several donkeys with injuries and fresh wounds. Donkeys play an important role in the local community of Maseke, pulling carts to fetch water, as many residents do not have access to running drinking water.

The team meets quarterly at the water collection point to monitor the condition and injuries of the donkeys. Owners are involved in treating minor injuries with Supona and other antibiotics donated by Rettet das Nashorn (Figure 9). Throughout the year we visited the water collection station and in the third term we walked in the community as some owners complained of sick donkeys that couldn't get to the vet in the community, we treated a total of 64 donkeys throughout the year.



In the second term we recorded 52 donkeys from 6 owners where 21 donkeys were injured but we managed to treat 19 of the donkeys due to the location of the treatment point, as the other injured donkeys couldn't come. Term three we had two meetings in the community, the first visit was at the tribal where 3 donkey owners brought 12 donkeys, the second visit we went to donkey owners' households, and assisted donkeys on the way to collect water, at the end we had treated 17 donkeys, 2 goats and 4 dogs over a 2 and half hour duration. The wounds were caused by the donkeys biting each other and the front of the cart hitting the back of the donkeys, and the bits from harnesses cause bleeding in the mouth.

Our success was that the vet was present in all visits that we held, and we look forward to saving, educating, and improving the relationship of the owners and their animals. And seeing more animals instead of donkeys being brought to access this health care facility was the highlight for the 2023 year.

5. The power of partnership

The Bush Babies Environmental Education program celebrated its 8th year anniversary at the resource centre, where the team reflected on the achievements and developments of the throughout the years.



Figure 10. Mhlahala Bush Babies attending the tree walk in Masorini Bush Lodge.

We partnered with Masorini lodge, Phalaborwa where we held the indigenous tree walk, we previously conducted the walks in Silonque Bush Estate and realised the neighbours had a lush vegetation with different tree species and we moved the walk to their premises. 10 of our schools including additional 4 schools in the Lulekani Circuit with 12 learners each took part in the walk and were introduced to new plant species such as the Rubber hedge, Baobab, and the combretum family.

We shared information regarding the uses of the trees by humans and wildlife, traditional beliefs, medicinal properties, and cultural uses (Figure 10).



Figure 11. Bush babies troop soccer team playing friendly matches locally.

Our Scouts and cubs started a junior soccer team and played a friendly game against the local team in their sponsored soccer gear through Naledi Bush lodge support, although we lost 2-0 the team is motivated to train more and play again in the next months (Figure 11). This gear set came with soccer boots, socks, t-shirts and pants enough for 4 soccer teams, this allowed the girls to also form clubs and join in on the games.



Figure 12. Bush Grannies with their marula products they sell at the celebration.

Our Bush Granies came together at the resource center during the Marula fruiting season to make the traditional morula beer, juice and jam for the Traditional marula celebration at Maseke. We all learnt from the grannies how they make the beer and attended the celebration (Figure 12).



Figure 13. Lewyn Maefala presenting about the Bush Babies program at the Royal Geographical Society in London, October 2023.

Our project manager was invited by Helping Rhinos to be a keynote speaker at the Royal Geographic Society in London, focusing on how they engage with local community members on educating and conserving the rhino and other endangered species together with founder and CEO Simon Jones, actor Peter Egan, conservationist Giles Clark, Samuel Mutisya from OI Pejeta conservancy and zoologist

Megan McCubbin, as part of their fundraiser which also assist the Bush Babies and Black Mamba APU programs (Figure 13).

After the event she met with Holly Budge founder of How many elephants in Winchester, where they both spoke at Ditchem Park school and Cheltenham ladies' college about the environmental issues that the elephants are faced with, and how rangers are working tirelessly in protecting the endangered species. This was a lifetime opportunity for first time traveller Lewyn, she was treated to a sight-seeing tour around the UK and learnt about its history, made new friends, and enjoyed the cuisines that are found in the area.

6. Bush Camp and HERD excursions

We have successfully hosted a total of 100 learners, with 10 top performing learners per school throughout the year. This is an all-expenses paid camp held at the Ekuthuleni Conservancy (Black Mambas headquarters) for 2 nights and three days. Learners are introduced to bush life where they get to interact and learn more about nature.



They participate in guided bush walks, game drives, star gazing, mapwork and orientation and get to connect with nature. On the morning of day 2 the learners have an early start at 04h00 am as we drive to HERD in Kapama. At HERD, Hoedspruit Elephant Rehabilitation and Development center where they interact with the elephant herd and learn more about how the elephants joined the herd before they touch the elephants. In the third term two of our Bush grannies joined and saw and touched an elephant for the first time in their lives

Figure 14. Black Mamba Naledi, Bush granny and Bush Babies at HERD. (Figure 14).

We would like to thank HERD Izindlovu fund for sponsoring our learners to access the facility and Kansas City Zoo together with Connected planet for the sponsoring of transportation of the learners whilst they are camping.



Figure 15. Special moment at HERD as learner interacts with the elephant.

The visit to herd is another way of looking if we can use education to change the behaviour of locals, indeed it is a tool that yields positive results as everyone at first is scared to interact with the elephants but after a few moments they leave the centre with memories and can't wait to share with the other community members (Figure 15).

7. Scouts in the Kruger

We were approached by one of our funders John from Soldiers for wildlife who has sponsored out scouts in Kruger initiative, where 20 learners are taken in a bus for a day visit into the Kruger National park, Soldier for wildlife have taken 5 groups (100 learners) in the 2023 academic year, and our learners have seen different animal species and get to cool off in the swimming pool which is also paid for.

On their way to Letaba camp, they get to Masorini archaeological site where they learn about the history of the Ba-Phalaborwa area and how the people used to mine the copper, and their social structures and how they lived as chiefs and their families (Figure 16).

We are truly grateful that this sponsorship pays for the transportation of our learners, the catering of all kids (breakfast and lunch) and goodie bags, that are filled with sweets for the children to eat as they tour the Kruger National Park.



Figure 16. Masorini guide explaining to the Bush Babies how they melted the iron.

The Bush Babies team would like to thank all those who have continued to support this program. Contributing is not just about donating; it is about making a difference!

NGiyathokoza! **ro livhuwa!**
ke a leboga! **enkosi!**
 dankie! **thank you!** **ndo livhuwa!**
inkomu! **ngiyabonga!**
ke a leboga!
siyabonga!

Siyabonga Rettet das Nashorn For the medical supplies of the donkey outreach, we were able to treat the injured and wounded donkeys.

Ndo livhuwa Kansas City Zoo for the sponsorship of our Scouts troop meeting food ration, this has enabled us to feed more than 1058 learners from February and we served two meals per child during the school holidays.

Inkomu Connected Planet for sponsoring the Bush Grannies and granddaughters Koru camp earlier this year.

Enkosi Kjell Bismeyer from Naledi Bush lodge for partnering us up Veronika Hofstetter and sponsored the Scouts soccer team gear, that they wear proudly and represent us in the local community.

Dankie to the Black Mamba Anti-Poaching Unit for assisting with the Bush Babies program during these crucial times, as our sister program you out your way to assist the program.

Thank you to all the Environmental Educators from the different local communities who work very hard in addressing the environmental issues and going beyond the call of duty in making a change in the communities!

PART C – NDLOVU BUSH CAMP

Ndlovu Bush Camp was established in Olifants West Nature Reserve in 2006 by Transfrontier Africa, to host volunteers from all around the world. Volunteers represent an invaluable asset for the organisation, as they support research projects and general reserve management. This program also offers an opportunity for volunteers to learn about conservation in an African ecosystem, South African flora and fauna and living in the bush. By making them ambassadors for conservation in their home countries (in South Africa or abroad), Transfrontier Africa aims at raising environmental awareness globally.

Located in a Big-5 area, Ndlovu Bush Camp provides a unique opportunity for volunteers to learn how to live sustainably in our environment (*e.g.*, with limited water resources), and to understand and respect the surrounding wildlife. Volunteers are guided towards these objectives by the camp manager/ess, who lives on-site and oversees the daily life in camp and the work in the field, and by Transfrontier Africa staff members, from camp assistants to Black Mambas, who initiate them into the various aspects of conservation. Indeed, volunteers are involved in a wide range of actions in the field, from research projects and reserve management, to security, recurrent projects (Table 1), to which temporary or unique activities are added. They also have the opportunity to meet with the Black Mamba Anti-Poaching Unit and the Bush Babies Education Team, to understand the importance that securing the landscape, developing and educating local communities has in conservation.

Table 1. Overview of recurring annual activities supported by Ndlovu bush camp volunteers.

Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alien veg. (cacti)												
Alien veg. (drainage)												
Borehole monitoring												
Ecological Carrying Capacity												
Fence – vegetation clearing												
Fire monitoring												
Game count												
Hides – bee pheromones project												
Intern projects												
Phytomass												
Predator-prey survey												
Rhino monitoring												
Study abroad programs												
Tree wrapping												

1. Daily life & camp improvements

Daily life in camp never feels dull. Volunteers and interns get a behind-the-scenes look at conservation practices and life in the bush. This includes sharing daily life with elephants, with whom relationships can be very ambivalent. Elephants regularly break the water tank pipes during drier periods, sometimes leaving camp without running water for several days. These events are an opportunity for the volunteers to realise the importance of managing water resources sustainably. To counter this, the volunteers frequently pile stones around the tank, to deter elephants from approaching (their feet are sensitive!). So, every elephant sighting triggers a variety of emotions... having elephants walk through the camp is always unique and wonderful for the volunteers, but we always worry about our water! Our current water dilemma has seen us with an empty tank and broken system since the beginning of December! Our beehive that usually deters the elephants was upended and the water pipes ripped out of the tank by a gorgeous breeding herd. We have had some amazing elephant encounters of late which make it all worthwhile. Mums and bubs meandering through camp peacefully as well as some big males crashing around in a strop (Figure 1). In addition to the elephants, we've also had some very special visits from hyena, wild dogs, honey badgers and lions. There is never a day that passes without something truly incredible and unexpected to experience.



Figure 1. Elephant feeding behind a chalet in Ndlovu bush camp.

As the camp is situated on a hill, our deck offers a 360-degree view of the landscape, and therefore constitutes the best place to enjoy the African sunset. Our volunteers love spending time up here day and night. It's a favorite spot for sunbathing, reading, yoga, star gazing, wildlife viewing, photography and of course on those hot still nights it's an incredible place to sleep under a blanket of stars with the sounds of the lion and hyena to usher you to dreamland.

In the evenings, around the campfire, lectures on conservation practices give volunteers and interns an overview of the projects carried out by the organisation and their importance in the overall scheme. This year we have had many chances to gain a better understanding of everything from invasive plant management to the pangolin poaching crisis (Figure 2). The information provided during these presentations then leads to interesting conversations in the field where the hands-on work complements the knowledge. Just as it is educational for the volunteers, it is also an eye opener for those living and working in this environment. We have been able to gain a better understanding of what conservation means to other nationalities and cultures and gain a better perspective on our work from their viewpoints.



Figure 2. Glen Thompson, TA's pangolin specialist, giving a presentation on the pangolin poaching crisis to Ndlovu volunteers.

In addition to the lectures given by staff members, the volunteers also attend presentation evenings once a month where research interns present their projects they are working on. Volunteers are provided with in-depth information and statistics about the unique projects they are involved with in the field. Projects hosted by the research department this year have been diverse. Most recently we have been fortunate enough to be involved in assisting interns from Aalborg University with their drone assisted eDNA capture at locations throughout the reserve (Figure 3). We are all eagerly awaiting the results of this new method of species monitoring and looking forward to the project continuing into the future (see Part E).





Figure 3. Volunteers assisting Nete and Louise, from Aalborg university, with their drone assisted eDNA capture in OWNR.

This year volunteers also assisted in a controlled burn (Figure 4). The experience provided valuable information and discussion to our volunteers on the role this has in ecology and gave us all hands-on experience in fire management. We were relieved that everything went to plan, and the fire remained This year volunteers also assisted in a controlled burn. The experience provided valuable information and discussion to our volunteers on the role this has in ecology and gave us all hands-on experience in fire management. We were relieved that everything went to plan, and the fire remained under control. Experiences such as this prepare us to be more effective and useful in future burns as well as emergencies.



Figure 4. Volunteers assisting with a control burn in OWNR.

Another exciting Transfrontier Africa project that camp got involved in recently was the upgrades to the Bush Baby camp on Ekuthuleni (Figure 5). Volunteers and staff all pulled together to build new bathrooms, septic system, and entertainment deck, lay new water and sewerage pipes, widen road access and clean up the water hole. Volunteers and interns all pitched in blood, sweat and tears and managed to get the camp upgraded in time for our first tour company visit. Intrepid tours will regularly utilize the Bush Baby camp and use the opportunity to interact with the Black Mamba's teams to learn more about conservation efforts.



Figure 5. Volunteers helping to upgrade the Bush Baby camp on Ekuthuleni.

2. Animal Sightings

As the camp is not fenced, we have the opportunity to observe a wide variety of animals passing through it. This gives the volunteers the opportunity to experience wildlife from a unique and atypical point of view: they regularly wake up to elephants outside their rooms (Figure 6), come across hyenas at night around the campfire and, everyone's favourite, listen to lions calling late at night while lying on their beds.

We asked the volunteers to tell us about their favourite sightings:

“Ezulwini was just amazing!” – Tom, intern from the Netherlands.

“All the animal sightings were great, but one of my favorites was the lions and lion cubs as well as the elephants up close at the camp” – Ricky, volunteer from Germany.

“My favorite animals to see are the hyenas. When one came right up to the fire pit while we were in the Lapa was amazing. Also seeing the baby hyenas at camp was incredible” – Lennart, volunteer from Germany.

“Seeing an aardvark on night count drive!” – Kimberley, volunteer from USA.

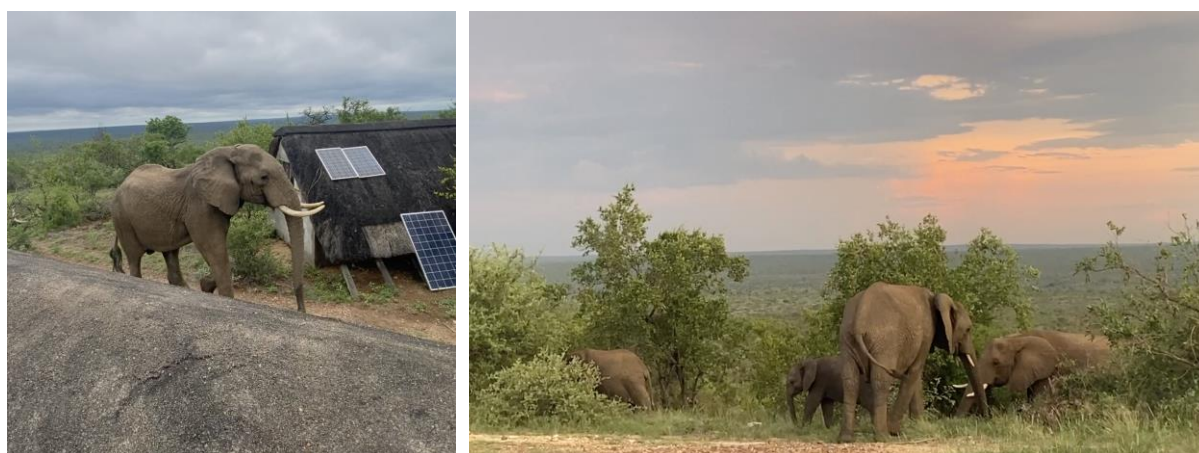


Figure 6. Elephant sightings in and around Ndlovu bush camp.

3. Volunteer Activities

This year, volunteers got involved in a wide variety of activities, listed in Table 2 and described below.

Table 2. Activities supported by Ndlovu Bush Camp volunteers

*NOTE: Data does not include the period of April - June 2023. In addition, no/limited data is available for the following activities for the period January - October 2023: Night count; Snare sweeping; Fire monitoring; Game count; Eco carrying capacity; Tree wrapping; Formicine ants; Reserve Maintenance; Community projects; intern projects.

Project	Nb. of Working Days
Alien vegetation	68
Rhino monitoring	32
Boreholes	45
Grass survey	13
Fixpoints	35
Hides	45
Formicine ants	28
Night count	3
Snare sweeping	6
Phytomass	5
Predator-prey survey	18
Reserve maintenance	10
Fire monitoring & assistance	4
Tree wrapping	9
Tree survey	2
Community projects	15
Research intern assistance	7
Total	345

Alien Vegetation

Invasive alien plants are plants introduced into South Africa from other countries, intentionally or unintentionally, that cause human, environmental and economic damage. In the absence of natural enemies, these plants reproduce and spread rapidly, taking valuable water and space from our native plants (see Part D.2).

Alien vegetation control and monitoring constitutes an ongoing project and aims at protecting our native biodiversity. Our teams tackle various parts of Olifants West Nature Reserve every week to not only eradicate invasive plants, but also to monitor previously treated infestations and log new areas of interest (Figure 7). While completing other field work our staff and volunteers are also constantly on the hunt to spot rogue alien vegetation which then gets recorded for future processing if it can't be dealt with at the time.



Figure 7. Volunteers conducting alien vegetation control in the field.

Formicine ants and Bee pheromones

Human-elephant conflict (HEC) and human-wildlife conflict (HWC) have increased due to increasing urbanisation which reduces the size of natural habitats and fragments them. As a result, elephants and communities are competing for land and water resources. In this global context, Ndlovu Bush Camp is involved in a research project investigating whether bee pheromones and formic acid can be used to deter elephants from raiding crops, breaking infrastructures, and uprooting trees. In this project, volunteers spend the day in a hide facing a waterhole and monitor the animals' response to chemicals that mimic bee pheromones and formic acid, and survey trees to look for elephant damages and formicine ants (Figure 8).



Figure 8. Volunteers observing elephants' behavior from a hide (left) and looking for ants and elephants damage on a tree (right).

Our ant project has always been a source of interest with our volunteers. The concept that something as tiny as an ant can impact an elephant broadens the enquiring minds

of those involved. Unfortunately, the project has been temporarily put on hold with the recent results of our latest data being inconclusive. It has been hypothesized that there may be multiple types of *Crematogaster* ants and only some of them are formicine producing which have the potential to deter elephant damage to trees and property. We hope this project will revive soon with new insights and a clear direction.

Rhino monitoring

Every fortnight a team goes out to look for evidence of rhino presence, such as active middens and rhino tracks, and to service our rhino monitoring camera traps (Figure 9; see Part D.1). Camera traps allow the ecological monitoring team to identify which rhino are in the areas by checking ear notches, check for any injuries and monitor their activity. Camera traps also allow us to get sneak peeks of brand-new youngsters like this special little calf (Figure 9)! Our volunteers have also had the opportunity to assist in the dehorning process this year (Figure 9). Much debate on the pros and cons was had around this time and those involved in the procedure came away with a deeper understanding of what the process entails for staff and wildlife.



Figure 9. Volunteers checking up a rhino monitoring camera trap (left) and assisting in a rhino dehorning operation (top right) and image of Tumela and her new calf taken by one of TA's camera traps (bottom right).

Borehole monitoring

One of our weekly projects includes borehole monitoring. This monitoring has been ongoing since 2019 and involves 7 boreholes across OWN. Groundwater depth measurements help manage this important resource on which we depend for many

uses. Although it is rare for water in a borehole to run out, water levels can drop drastically in times of drought, and consumption must therefore be adjusted. We have had some challenges this year with faulty equipment after a hyena dragged the dip meter out of camp and into the bush one evening, but we are back on track collecting data weekly to monitor how the rains will impact the water table (Figure 10).

Fixed Points Photography

In any ecosystem, the vegetation forms one of the pillars on which the complex food-web rests. A healthy ecosystem is not sustainable without a healthy vegetation base and monitoring it is therefore essential. In light of that, pictures are taken monthly (twice a month in spring) by Ndlovu Bush Camp at fixed determined points (Figure 10) and the evolution of the vegetation over time at these points will be later analysed by TA's Research Department.



Figure 10. Volunteers checking the water table level in one of the monitored boreholes (left) and taking a picture at one of the fixed point photography sites (right).

Rodent Survey

We also had 2 interns visiting us from Western Kentucky University to complete a rodent survey. The rodents were captured in areas of previous controlled burns and unburned sites and analysed before being released (Figure 11). This data will allow us to see how a burn affects recolonisation of an area.



Figure 11. Volunteers assisting with rodent captures and measurements.

eDNA Collection

This year we had 2 interns from Aalborg University on the reserve to collect eDNA samples which will be analyzed back in Denmark. Our volunteers were fortunate enough to assist with the fieldwork and help with the collection and processing of

samples. The project required the use of drones to collect air and dust samples. Water samples were also collected as well as camera trap footage at each site. We are looking forward to more interns from Aalborg visiting us in 2024 to continue the research started this year. It is a fascinating project utilizing new technology and volunteers and staff alike are waiting excitedly for the results!

Predator Prey Study

The interactions between predators and preys contribute to the stability of the ecosystem eliminating vulnerable individuals such as the old, weak, and young. This allows more food to contribute to the success and survival of the stronger individuals and in turn protects the species.

Volunteers helped collect large predators' scats samples at strategic sites and later processed them to remove animal hairs (Figure 12). An intern from the Netherlands has been busy with the help of the volunteers to identify these hairs under a light microscope and record the data. Identifying what prey is being eaten by the predators gives an insight into the biodiversity and health the ecosystem.



Figure 12. Volunteers collecting predator scat in the field (right) and analyzing their content in the lab (left).

Controlled Burn

Fire is a valuable tool in the management of natural vegetation, particularly in savanna areas such as OWNr, which receives a relatively low rainfall compared to other areas in the eastern Lowveld. Fire is a natural component of the system that has been excluded for too long. Veld burning serves two useful purposes:

- It removes old, unpalatable (moribund) grass unused by herbivores during the previous seasons, which tends to smother the remaining grass if it is not removed (grass plants have basal meristems and therefore require light to penetrate to the soil surface).

- If the veld is burnt regularly with an intense fire (>4 t ha⁻¹ standing grass; >25 °C; and up to 20 km h⁻¹ wind), it suppresses the establishment of young trees and helps to reduce bush encroachment.

For these reasons, a controlled burn was conducted in November 2023 in OWRN and Ndlovu Bush Camp’s volunteers participated in these operations (Figure 13). They also assisted in controlling fire that occurred accidentally throughout the year in the reserve.



Figure 13. Volunteers taking part into a control burn in OWRN.

4. Sunday Adventures

To reward the volunteers after their six days of work and to offer them the opportunity to discover different landscapes outside of OWRN, we take them on adventures on Sundays. We have visited waterfalls and rivers, reptile parks, the Kruger National Park and even organized a few private run tours for our volunteers (Figure 14). These experiences allow them to see and learn about more than we can provide them within the reserve and enhances their stay with us with some amazing memories!

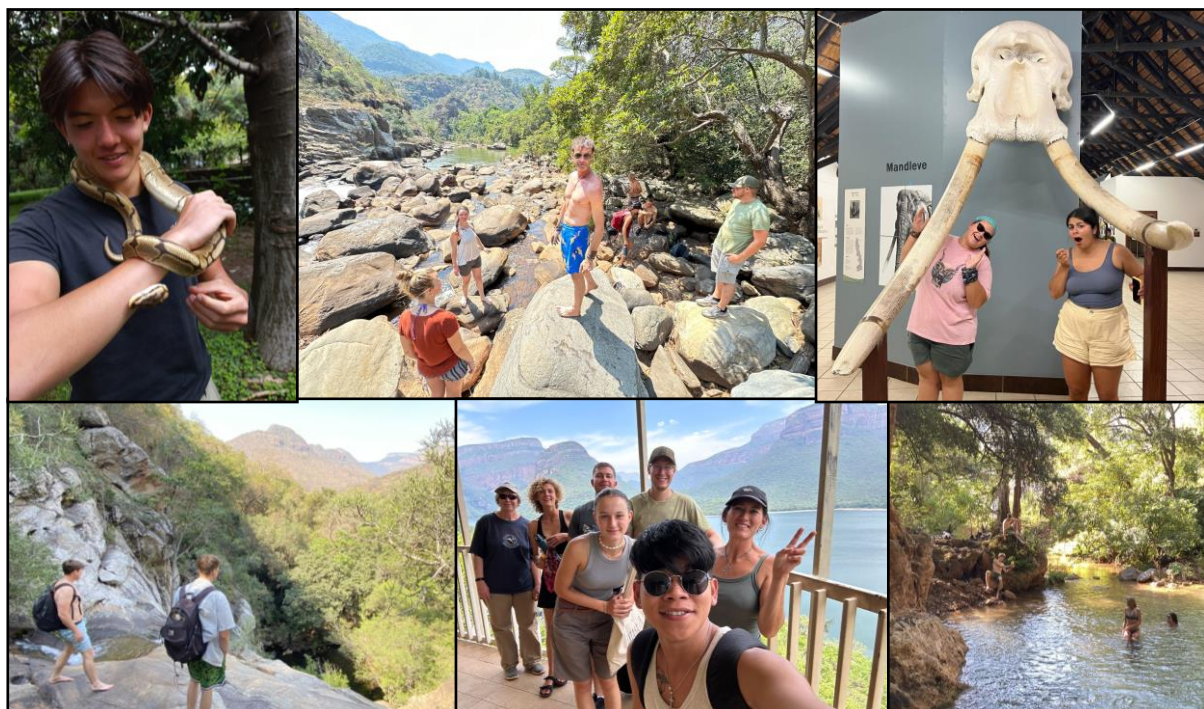


Figure 14. Pictures of TA’s volunteers on various Sunday adventures.

5. Booking statistics

Ndlovu bush camp has the capacity of hosting 10 volunteers in 5 shared chalets, with 3 remaining chalets occupied by the camp staff members. We have had our first Japanese volunteers this year, amongst our usual intake from European countries, the UK, USA, Australasia etc (Figure 15; Table 3).



Figure 15. Groups of TA’s volunteers present in Ndlovu camp in 2023.

Table 3. Monthly bookings, bed nights and camp occupancy for 2023.

Month	Nb. of volunteers	Bed nights ¹	Occupancy ² (%)
January	8	97	42.17
February	12	174	62.14
March	9	226	72.90
April	8	161	53.67
May	7	169	54.52
June	15	244	78.70
July	9	118	38.10
August	10	155	50.00
September	9	133	44.30
October	10	158	51.00
November	9	150	50.00
December	6	72	37.90
Total	112	1857	-
Average	-	-	52.95

¹ The number of bed nights corresponds to the number of beds occupied by volunteers x the number of nights these beds were occupied. ² The occupancy is calculated by dividing the number of bed nights by the number of available bed nights (number of beds x number of days in the month).

The Ndlovu Bush Camp team would like to thank all those who have continued to support this project and looks forward to welcoming many more people from all over the world!



PART D – ECOLOGICAL MONITORING

1. Rhino monitoring

Black (*Diceros bicornis*) and white rhinoceros (*Ceratotherium simum*) populations are both threatened by habitat loss and poaching (illegal trade of rhino horn), and are classified as Critically Endangered and Near Threatened, respectively, on the IUCN Red List. In this global context, local monitoring of their population and global collaboration are essential. The Black Rhino Range Expansion Project (BRREP), which was founded in 2003 by World Wildlife Fund (WWF), Ezemvelo KZN Wildlife, Eastern Cape Parks, and Tourism Board, is one of these attempts to join local and global forces to counter the drastic decline in rhino populations. Its aim was to increase black rhino populations by reintroducing them in suitable protected areas to create new breeding populations. As Olifants West Nature Reserve offers suitable protected black rhino habitat, it was included in the project in 2011, when 19 black rhinos were introduced from Great Fish River Nature Reserve. To monitor the success of this project, Transfrontier Africa has committed to gather all the sightings of both species in OWNR, and to share this data on a monthly basis with Balule Nature Reserve, which is in charge of relaying it to WWF. To this end, landowners, lodges, and TA staff members are encouraged to relay any sightings, and camera traps are placed at key locations in the landscape (e.g., waterholes, active rhino midden).

Where possible, the individual rhinos are identified based on their specific ear notches, and their species, sex, age class, location (coordinates), number of individuals, behaviour (activity, direction), and body condition are recorded. It also allows us to build a consistent database over time that can be used to monitor their population dynamic, their temporal activity pattern, and their spatial distribution in the reserve, as well as their health condition (especially in times of drought).

Between January and December 2023, 523 sightings of black rhinos (totalling 715 individuals observed), and 520 sightings of white rhinos were reported (totalling 738 individuals observed) (Figure 3; Table 1), and 1 sighting reported the two species co-occurring.

21% of the sightings were reported by lodges and landowners, 67% per camera traps and 10% by TA members (Table 1), which remained consistent through the year. 82.4% of the black rhino sightings and 67.9% of the white rhino sightings were identifiable, which allowed us to locate and monitor all the known individuals of both species at least once during the past year, with Zulu and Balu being the most reported black and white rhinos, respectively (Figure 1; Table 2). In July, Move was also seen for the first time in Olifants West, after being last recorded by our teams in Olifants River and Ukhozi in 2018 (Table 2).



Figure 1. Zulu (left) and Balu (right) reported by landowners in OWRN in 2023.

The proportion of identifiable black rhino sightings increased compared to 2022, reaching a value of 82.4%, just above the overall average of 81.4% (Figure 2). The creation of a white rhino ID kit for OWRN led to a neat increase in white rhino identifications, which was translated by the highest value of identifiable white rhino sightings in OWRN since 2012 (Figure 2). Indeed, the number of identifiable white rhino sightings peaked at 67.9% in 2023, against an overall average of 16.8%, calculated over 11 years of data collection. Besides offering a better understanding of our white rhino population and revealing that at least 18 individuals were living or traversing OWRN, with a sex ratio of 1.6 male per female (Table 2), it also allowed us to ID the majority of the white rhino sightings, previously written as unknown during the past couple of years.

Table 1. Rhino sightings statistics.

Species	Number of observations						Number of observations by		
	Sex			Adults	Sub ¹	Calves	Lodges & landowners	Camera traps	TA staff members
♂	♀	NA							
Black rhinos	285	313	120	539	21	157	112	369	39
White rhinos	395	134	212	634	22	82	110	337	68
Total	680	447	332	1173	43	239	222	706	107

¹Subadults.

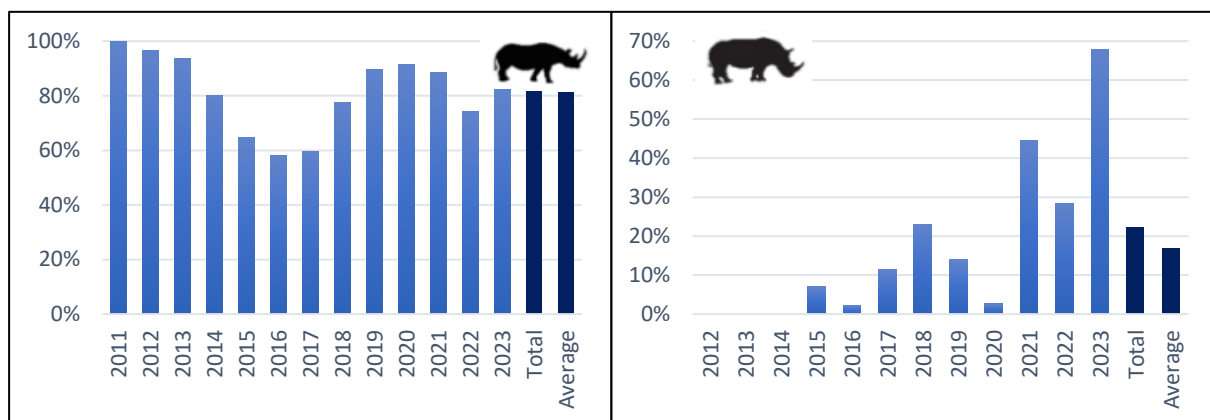


Figure 2. Proportion of identified black rhinos (left) and white rhinos (right) reported from 2012 to 2023.

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Table 2. Rhino sightings statistics between January and December 2023.

Sp.	Name	Notch #	Sex	Year of birth ¹	Date Last Seen	Body Condition ²	Identifiable Sightings
Black rhinos	Aphela	114	M	2007	29/12/2023	4	45
	Dakari		M	2022	24/12/2023	4	81
	Deena	11	F	2008	24/12/2023	4	84
	Dotty	130	M	2015	25/11/2023	4	27
	Duchess	40	F	2006	20/12/2023	4	49
	Dri	/	F	2023	20/12/2023	4	40
	Duke	1	M	2020	19/12/2023	4	10
	Isaac	38	M	2008	15/11/2023		14
	Kambani	208	M	2017	16/09/2023	4	12
	Khuza	3	F	2008	18/11/2023	4	31
	Kwezi	10	F	2020	19/12/2023	4	26
	Move	221	F	2006	05/07/2023	4	2
	Mugisa	84	F	2018	27/06/2023		7
	Raza	120	F	2017	17/12/2023	4	21
	Rio	/	/	2023	10/09/2023		1
	Tiyani	Nat.	F	2020	23/11/2023	4	24
	Tumela	20	F	2014	25/12/2023	4	25
Zulu	66	M	2005	28/12/2023	4	92	
White rhinos	A1	40	M	A	14/11/2023	4	3
	A3	84	F	A	20/11/2023	4	11
	B15	78	M	A	23/12/2023	4	40
	B2	6	F	A	13/12/2023	4	20
	Balu	82	M	A	19/12/2023	4	101
	Bangles	59	F	A	24/10/2023	4	16
	E10	94	F	A	20/12/2023	4	22
	F10	36	M	A	28/12/2023		67
	J4	8	M	S	28/08/2023		13
	K3	30	F	A	21/12/2023	4	15
	N2	69	F	C	21/12/2023	4	19
	N3	38	M	A	02/10/2023	4	12
	N4	104	M	A	29/09/2023	4	15
	O2	105	M	C	20/12/2023	4	15
	O3	103	M	C	20/11/2023	4	9
	O4	34	F	C	13/12/2023	4	19
	Romeo	11	M	A	19/12/2023	4	54
Stompie	80	M	A	21/08/2023	4	47	

¹A = Adult (>5 years old); S = Subadult (3-5 years old); C = Calf (<3 years old).

The year 2023 was a successful year for the BRREP in OWRN: Duchess gave birth to a female, Dri, in May and both remained healthy through the dry season; Raza had her first calf in September, Rio, which hasn't been spotted since; and Tumela gave birth to a new calf in December (Figure 4). Dakari, Deena's son, born in January 2022 is healthy and growing fast (Figure 4). He was ear notched and dehorned with his mother in May 2023. Multiple white rhino calves were also observed on the landscape, but their exact age is unknown.



Figure 4. Deena & Dakari (left), Duchess & Dri (centre) and Raza & Rio (right) photographed in OWRN in 2023.

Moreover, OWRN welcomed new incomers white rhinos from adjacent or further reserves, such as N3 and N4, two bulls which crossed the river from the North to join OWRN for a few months. A white rhino cow and her calf were also reported in OWRN, which represented their first sighting ever in BNR. They are thought to be from the SAWC area, but no confirmation could be obtained so far. Larger groups of white rhinos were also often reported in the South of the reserve (Figure 6), and we observed the departure of Stompie, which left his adoption brother, Balu, to take his independence.

Furthermore, while the body condition score of some individuals temporarily dropped from 4 to 3,5 during the winter months, the rhinos remained healthy and most of them remained well fed throughout winter. A displacement of several black rhinos to the eastern parts of the reserve, where more browsing is available, and of most white rhinos to the south, where more grazing is available, was anecdotally observed and seems to indicate that rhinos are able adjust their range to food availability and are not restricted by physical or demographic barriers.

Overall, these are all indices that the conditions offered by OWRN are favourable to the presence and development of rhino populations.

Between May and August 2023, 14 rhinos – 8 black rhinos and 6 white rhinos – were also dehorned on OWRN by Balule Nature Reserve with the support of OWRN teams. Rhino dehorning is meant to reduce the risks of poaching, one of the main risks faced by rhino populations, and therefore improve the conservation of both species. During dehorning operations, the individuals are also inspected to assess their health and check for pregnancy, and ear notched when needed for identification and monitoring purposes. Occasionally, the individuals can also be tagged with GPS device that capture and send the position of the rhino at regular time intervals to a rhino monitor.

This improves our understanding of their movements and provides insight into the area to target in priority for anti-poaching patrols and monitoring. This year, 2 black rhinos were tagged with such a device: Zulu (Figure 1) and Kwezi, a young female born in 2020 (Figure 5). This initiative, undertaken by BNR, notably provided new information on the distribution range of both individuals in areas with lower human densities and therefore less eyes.



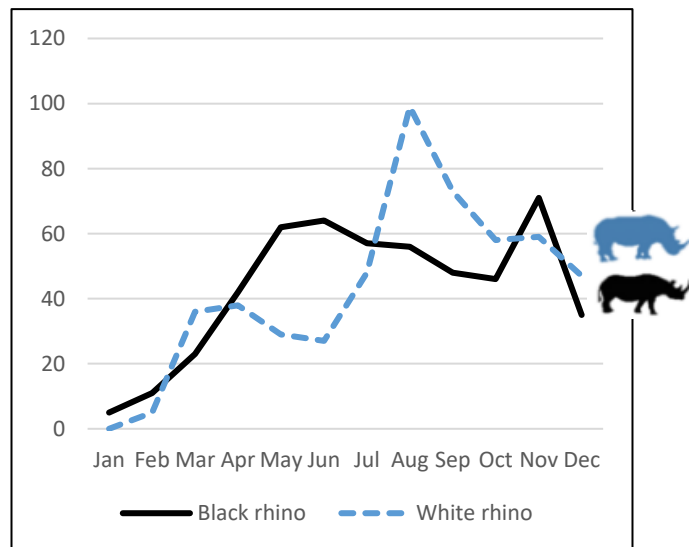
Figure 5. Kwezi before (left), during (centre) and after (right) her dehorning in August.

Finally, thanks to the implementation of 8 additional camera traps allocated to rhino and wildlife monitoring, and to the dedication of OWRN’s landowners and lodges and TA members, the number of rhino sightings reached numbers that hadn’t been equalled since 2015 (Figure 8), with a neat increase at the beginning of the year and a peak of observation numbers in November for black rhinos and August for white rhinos (Figure 7).



Figure 6. Group of 5 white rhinos observed in OWRN.

Figure 7. Number of rhino sightings per species and per month in 2023.



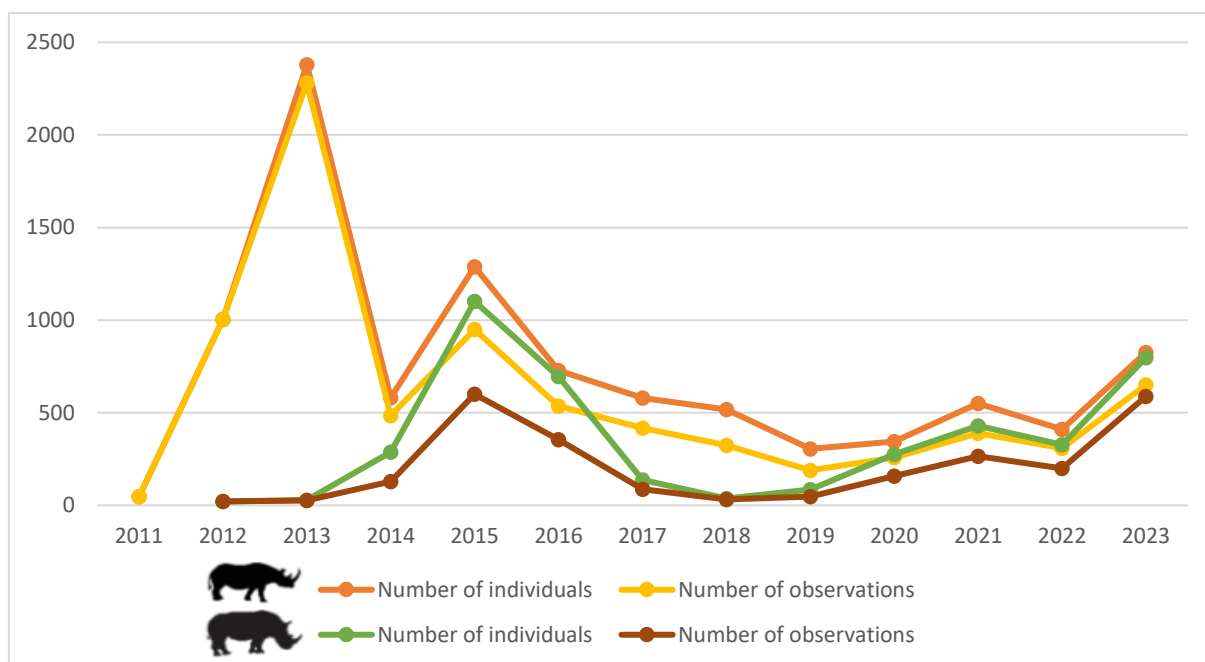


Figure 8. Number of reported individuals (plain lines) and sightings (dash lines) of black (dots) and white (square) rhinos from 2011 to 2023 in OWRN.

2. Invasive alien vegetation – monitoring & control

Human movements across the world have promoted the spread of species outside their native biogeographical ranges, intentionally or accidentally, leading in some cases to biological invasion (Lockwood, 2005; Alpert, 2006). Invasive alien species are able to invade new ecosystems thanks to their highly competitive and adaptive abilities and represents a threat to ecosystems and native species across the world (Sinclair and Walker, 2003; He et al., 2011). These invaders can notably exclude less competitive native species from a system, and eventually disrupt ecological functions and interspecific interactions (He et al., 2011).

Invasive alien plant species are well known and studied in South Africa and management measures have been established across the country to control and monitor their spread (Lotter and Hoffmann, 1998). According to the Conservation of Agriculture Resources Act of 1983 (CARA), invasive alien plant species can be classified in different categories depending on their invasive status in South Africa and the threats they represent for the ecosystem:

- **Category 1:** Invader plants must be removed & destroyed immediately.
- **Category 2:** Invader plants may be grown under controlled conditions only.
- **Category 3:** Invader plants may no longer be planted.

In OWRN and BOCCA, 14 category-1 species have been identified as invasive alien plant species and are the object of management measures (see list below). While lodges and private landowners have the responsibility to manage their populations on their land, Transfrontier Africa is responsible for the remaining parts of the reserve, assisting the lodges and landowners in detecting and treating the invaders, and

managing their population on Ekuthuleni (BOCCA). These species can be separated into two categories, which are managed differently: the cacti species can be found everywhere in the reserves and are mostly treated with biocontrol agents and chemical products, and the drainage line species are mostly found in drainage lines and removed manually (mechanical removal).

Cacti species:

- Boxing glove cactus (*Cylindropuntia fulgida*)
- Jointed cactus (*Opuntia aurantiaca*)
- Moon cactus (*Harrisia martinii*)
- Prickly pears – 5 species (*Opuntia* sp.)
- Queen of the Night (*Cereus jamacaru*)

Drainage line species:

- Large cocklebur (*Xanthium strumarium*)
- Large thorn apple (*Datura ferox*)
- Red sesbania (*Sesbania punicea*)
- White-flowered Mexican poppy (*Argemone ochroleuca*)
- Yellow-flowered Mexican poppy (*Argemone mexicana*)

Cochineal bugs (*Dactylopius coccus*) are used as biocontrol agents for the Prickly pear (*Opuntia* sp.) and bred in a controlled nursery located in Ekuthuleni. These agents feed on the cactus' moisture and nutrients, damaging, and eventually killing the host plant. Cochineal bugs naturally disperse with the wind and can also be purposely placed on target plants by adding an infected cladode on it. The insects will then spread from the infected cladode to the new host plant and establish a new generation on it.

Monosodium Acid Methane Arsonate (MSMA) is a selective herbicide which is sprayed on the cacti using a hand-pump sprayer. Both types of treatments are applied during the dry season, to increase their efficiency and durability, as rains tend to wash off the cochineal insects and chemical products.

Between January and December 2023, 2093 invasive alien plants were detected by Transfrontier Africa's teams, amongst which 1482 were treated biologically or chemically, or removed (Figures 9 & 10; Table 3). The large cocklebur accounted for 47.3 % of the plants detected and eventually treated and the prickly pear for 46.8 % of them (Table 3). All the large cockleburs were detected in the drainage line systems and removed mechanically in June, while 41.9 % of the prickly pears detected were treated with biocontrol agents (20.9 %) or MSMA (21 %) throughout the year (Table 3). Areas with high densities of prickly pears, or clusters, were also identified in OOWNER, and the efforts of our teams were therefore redirected towards these areas (Figures 9 & 10). Three different pathways led to the identification of these clusters:

- Information sharing between landowners and Transfrontier Africa;
- On-foot fieldwork in areas with low visibility from the roads and rarely walked by our teams and OOWNER's landowners;
- Vehicle patrols in areas less frequented by our teams and OOWNER's landowners.

As the cochineal bugs disperse with the wind, they are particularly effective in areas showing high densities of host plants and were therefore used in priority to treat these

clusters. The start of the wet season initiates the growth season for the prickly pears, providing ideal conditions for the biocontrol agents to reproduce and spread, optimizing their capacity to damage the plants before the first heavy rains start. These areas will have to be closely monitored over the next years, and regularly treated, to ensure that the prickly pears are effectively controlled, preventing the clusters from growing.

Table 3. Number of invasive alien plants treated per species and treatment method in OWNr in 2023.

Species	Untreated	Treatment applied			Total detected ²
		Biocontrol agents ¹	Chemical (MSMA)	Mechanical removal	
<i>Cacti species</i>					
Boxing glove cactus	2	1	0	0	3
Jointed cactus	9	1	0	0	10
Moon cactus	2	0	0	0	2
Prickly pear	511	205	206	28	979
Queen of the night	55	2	25	0	85
<i>Drainage line species</i>					
Large cocklebur	0	0	0	989	989
Large thorn apple	0	0	0	10	10
Mexican poppy	0	0	0	5	5
Red sesbania	0	0	0	10	10
Total	579	209	231	1042	2093

¹Biological agents mostly designs Cochineal bugs, but also includes cactus moths. ²The total of plants detected can be lower than the sum of the treatments applied, because treatments were sometimes combined (e.g., Biocontrol until the plant is sufficiently weak and small to be removed).



Figure 9. Prickly pear treated in June 2022 with biological control in OWNr (left) and revisited in June 2023 (right).

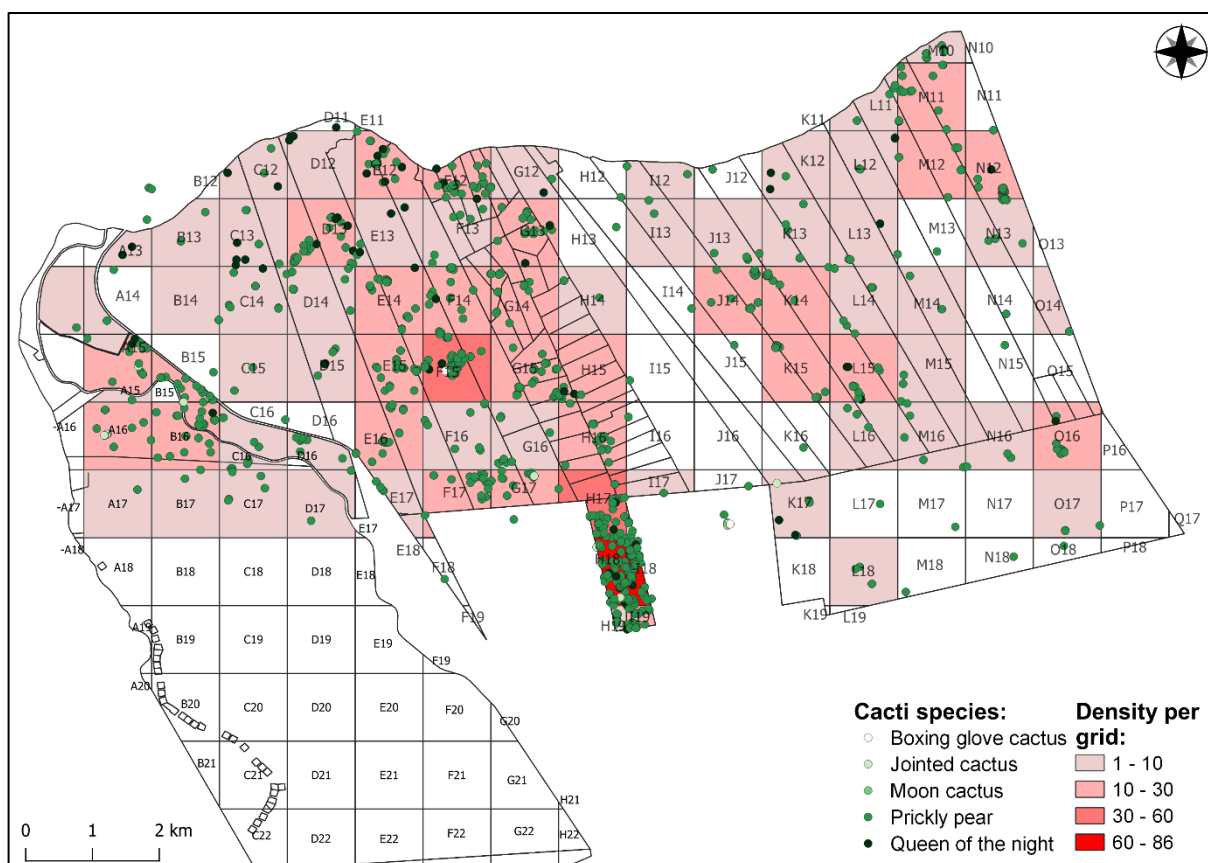


Figure 10. Invasive alien cacti species detected between January and December 2023.

3. Tree populations – monitoring, protection & control

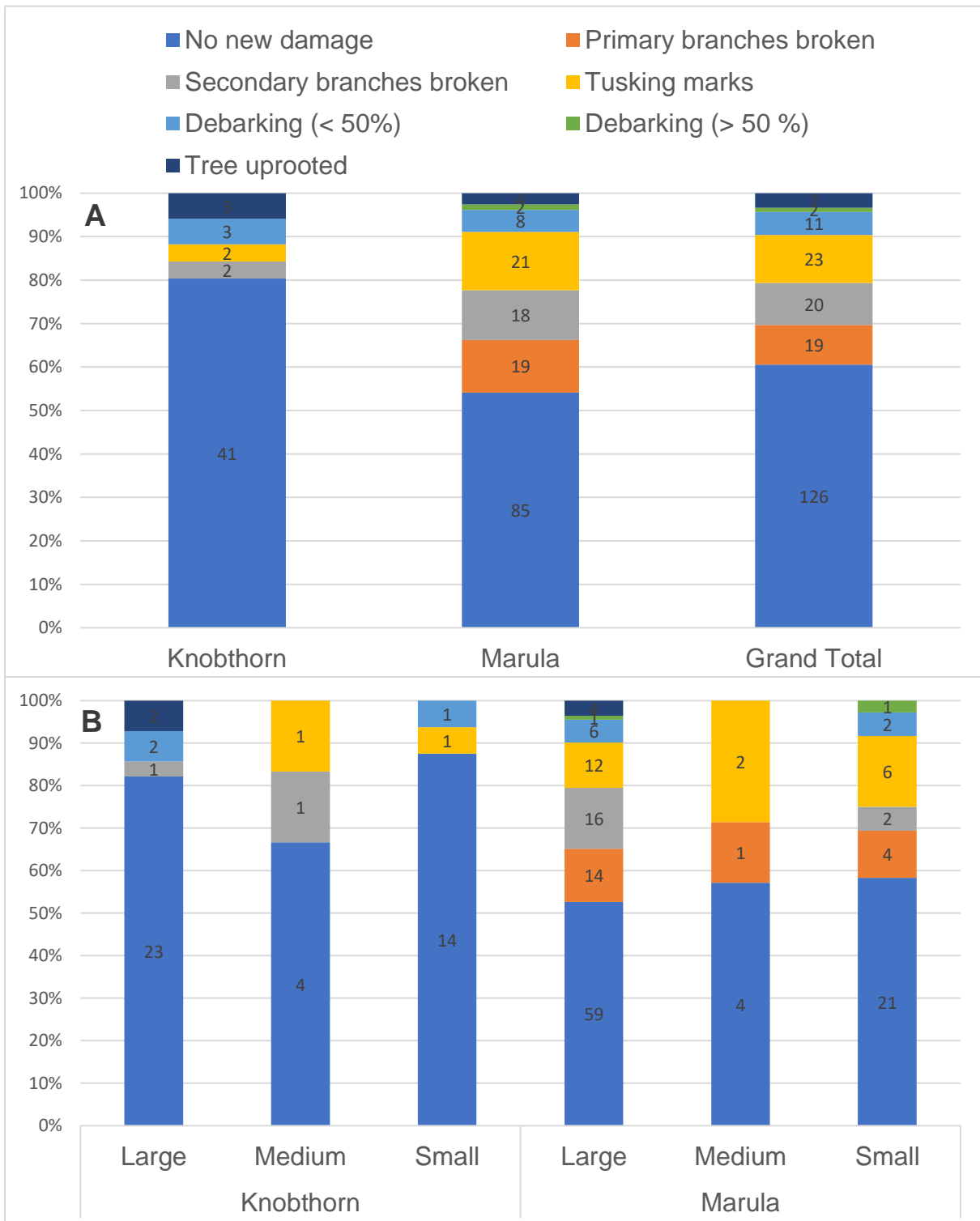
Trees play an important role in savannas by limiting soil erosion, stabilizing ground temperatures, providing refuges, shade and food resources to wildlife and influencing nutrient cycle and water availability (Belsky 1994, Lindenmayer et al., 2012). While elephant-driven tree mortality is a natural process, the establishment of fenced nature reserves coupled with an increase in artificial perennial water resources, can lead to an increase in this mortality rate due to an increase in elephant density (Derham, 2016). To reduce this rate, reserve managers can either reduce elephant population size (e.g., culling or reduction of water availability), or protect the trees from being damaged (Derham, 2016). There are numerous solutions, including surrounding the tree with rocks to limit its access to elephants, and wrapping them in meshed wire to limit the access to the cambium, i.e., debarking opportunities (Derham, 2016). This latter solution has been implemented in Olifants West Nature Reserve since 2021 to protect marulas (*Sclerocarya birrea*) and knobthorns (*Senegalia nigrescens*) from elephants, and its effectiveness is monitored by revisiting wrapped trees.

Between January and December 2023, 217 wrapped trees were revisited to assess the effectiveness of the wrapping against elephant damages (Table 4). Only 7 additional marulas were wrapped in 2023, totalling 672 wrapped trees in OWR since 2021 (Table 4; Figure 12).

Table 4. Number of trees wrapped since 2021, per year and species, and number of trees revisited between January and December 2023 in OWN R.

Species	Nb. of trees wrapped ¹ per year			Nb. of trees revisited	Total wrapped
	2021	2022	2023		
Marula	262	213	7	163	482
Knobthorn	54	136	0	54	190
Total	316	349	7	217	672

¹Wrapped in meshed wire, used as a protection against debarking by elephants.



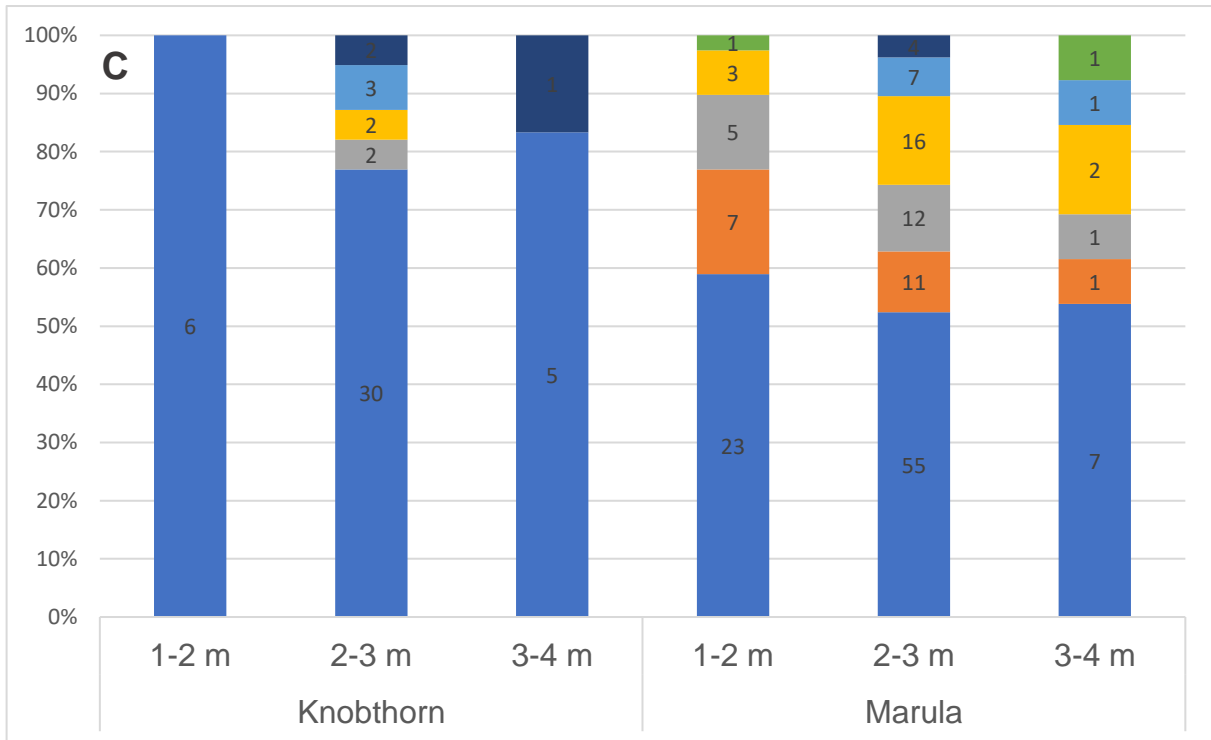


Figure 11. Elephant-caused damages on revisited wrapped knobthorns and marulas (A), depending on the mesh size (B) and the maximum height of wrapping (C).

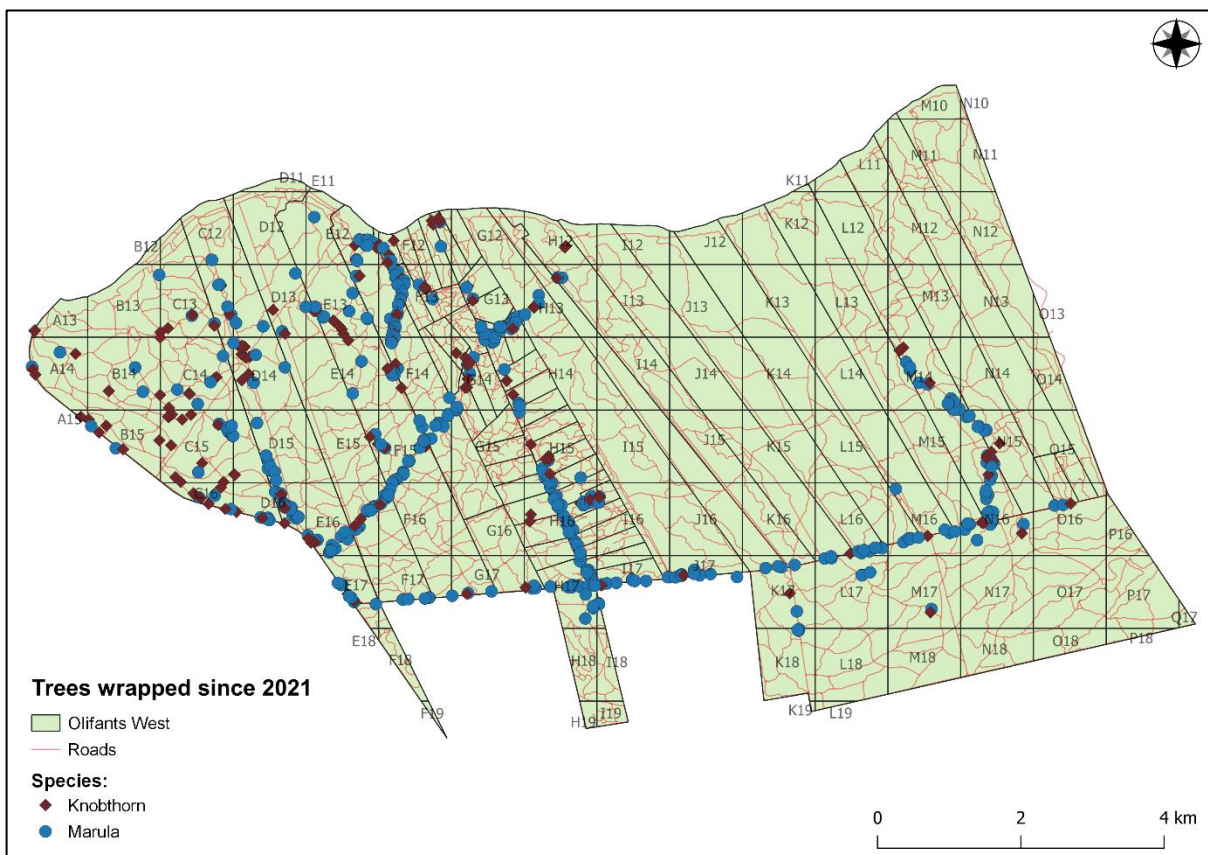


Figure 12. Knobthorns and marulas wrapped between 2021 and 2023 in OWRN.

80 % of the revisited knobthorns and 50 % of the marulas showed no new damages, with 42 % of the damaged marulas presenting non-lethal or major damages (e.g., ringbarking or uprooting) (Figure 11.A). Although we cannot draw any strong conclusions in the absence of true controls (non-wrapped trees), it appears that lethal elephant-caused damage on wrapped marulas and knobthorns remained minimum. This potential result is supported by a long-term study conducted in the Associated Private Nature Reserves (APNR) by Cook et al. (2023) between 2008 and 2020, which demonstrates that wire-netting improves the survival of large trees for a period of four years, after which the process must be repeated due to damage to the structural integrity of the wire. Similar results were found in the APNR by Derham et al. (2016).

It also appeared that smaller mesh size was associated with less elephant-caused damage for both species in OWNR, although the differences in sample sizes complicate the interpretation (Figure 11.B). Finally, a lower maximum height of wrapping (max. height of 2 meters above the ground) surprisingly appeared to lead to less high-level impact damages on the trees for both species, although a larger sample size would be necessary for the knobthorns (Figure 11.C).

Overall, based on these observations in OWNR and on the studies conducted in the APNR, tree wrapping seems to effectively reduce elephant-caused damage and mortality on marulas and knobthorns. Control trees (unwrapped monitored trees) should be added to allow for true comparison and interpretable results, but these first insights are encouraging.

4. Water table level – boreholes monitoring

Olifants West Nature Reserve is categorised as a hot, semi-arid, granite lowveld savanna (Mucina et al., 2006), with a long-term average annual rainfall of 421 mm (since 1985). Monitoring the water table level is therefore essential to ensure the sustainable water use by landowners and lodges present on the landscape. To do so, the depth of the water tables has been monitored weekly since 2019 in 7 boreholes, i.e., holes bored vertically in the ground to extract water, in Olifants West. Initially these measurements were taken quarterly but since we were gifted a dip meter we have been able to increase this to weekly measurements. The trend in depth of the water table is monitored over time and is linked to annual rainfalls, to establish recharge and consumption rates and propose management measures.

Following the presentation by Mike Holloway in 2022 we are now also in the process of establishing our own water monitoring committee on OWNR to monitor and advise the reserve on how to manage this precious resource. Mike has kindly agreed to join, bringing a lot of expertise with him.

All 7 of the surveyed boreholes experienced an increase of water table levels between January and December 2023, of 1.04 to 3.22 meters (Figure 13). While this increase in water levels reflects the peak in rainfall observed in early 2023 (Figure 15), it also highlights the limits of very intense rainfall that occurs in short events rather than over a longer period, as the increase figures are relatively small.

In most boreholes, we observed a neat peak in the water level following the heavy rains in February (Figures 14 & 15) which filled up the waterholes, after what we noted a slow decrease of the water level while we advanced in the dry season, returning slowly to the pre-rains level averages (Figure 14).

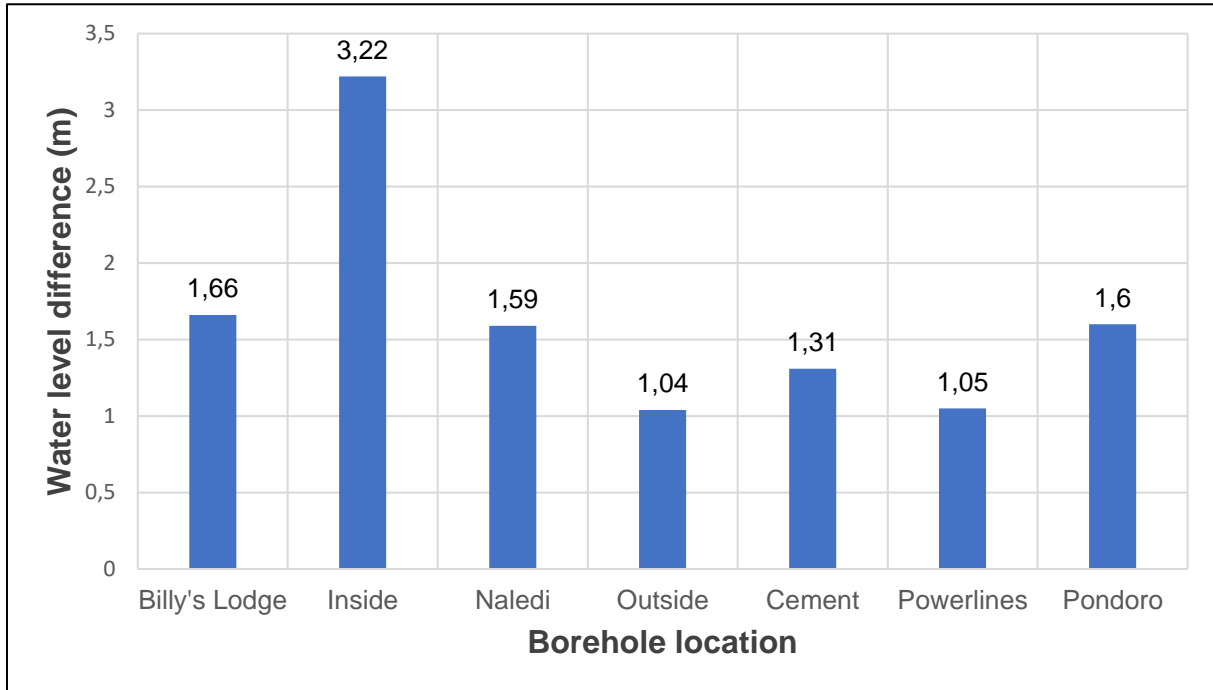


Figure 13. Water level difference between January and December 2023 per borehole.

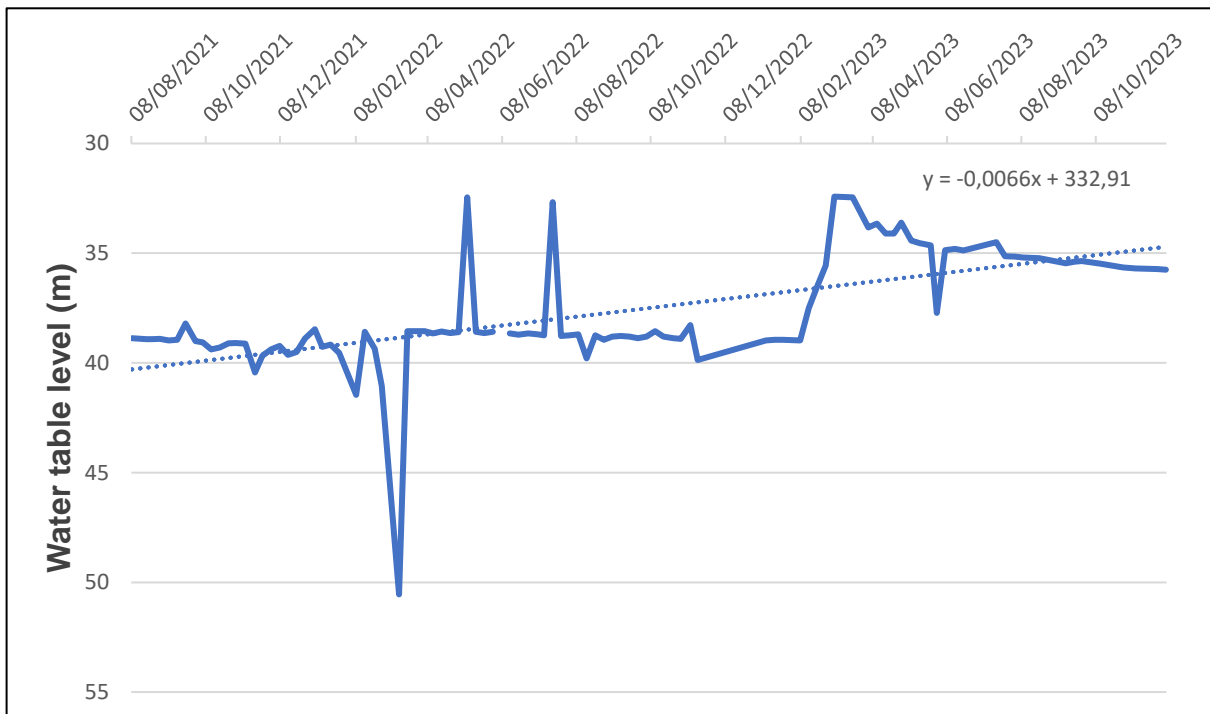


Figure 14. Water table level at 'Ba_09 Inside' from August 2021 to December 2023.

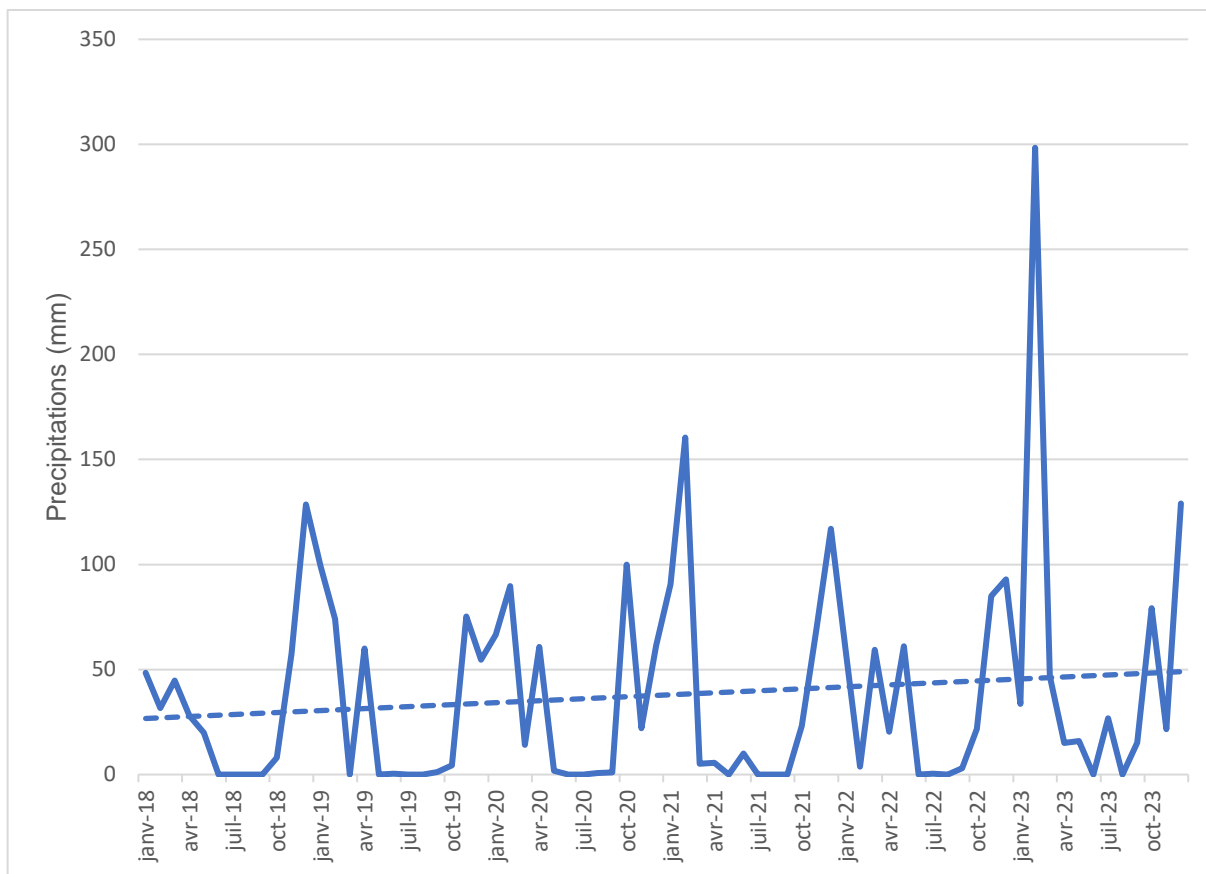


Figure 15. Monthly rainfalls (mm) in OWRN between 2018 and 2023.

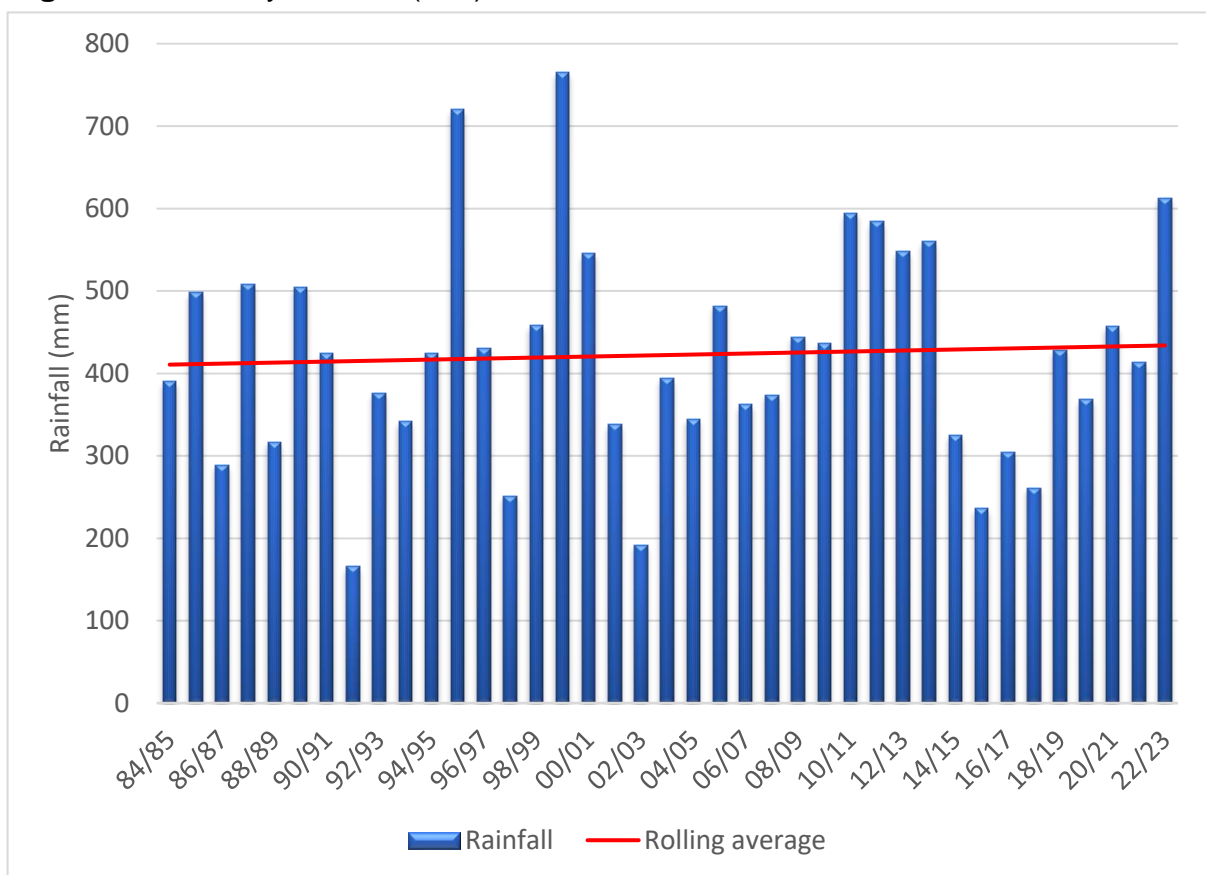


Figure 16. Annual rainfalls (mm) in OWRN from 1984 to 2023.

5. Phytomass

Grass phytomass is defined as the dry aboveground mass of grass per hectare and is a major determinant of carrying capacity and fire sustainability in semi-arid savannas.

Measuring phytomass in the reserve at the end of winter gives an indication of the food available at the lowest yield. If this can support the animal density in the reserve, it can support the animals for the rest of the year when there is more plant biomass available. Therefore, monitoring phytomass across Olifants West Nature Reserve (OWNR) and being able to predict and manipulate phytomass production are crucial components of ecosystem management.

The phytomass survey has been conducted every year since 2009 by the warden’s team. The survey occurs at the same time every year in late September to early October at the same sites (Figure 17). The bufferzone was not surveyed in 2023.

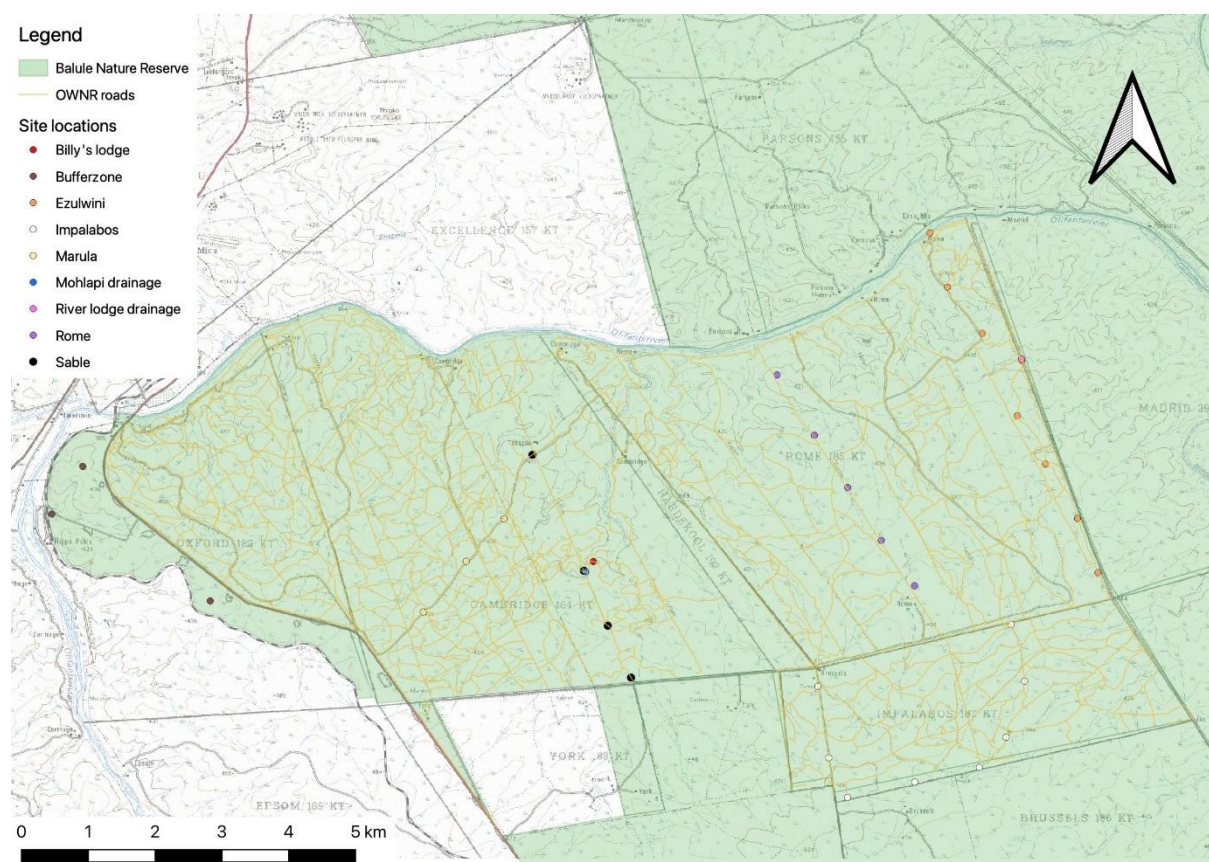


Figure 17. Site locations per region in OWNR and the bufferzone.

Phytomass varied among the regions, ranging from 388.87 kg/ha to 1034.72 kg/ha, with an average of 699.75 kg/ha and a standard deviation ± 464.42 kg/ha (Table 5; Figure 18). The average phytomass dropped between 2022 and 2023 in the reserve (decrease of 23.4 %), and in all regions except in Impalabos where we observed a slight increase of 9.2 %, and with the most significant decrease being observed in Ezulwini (decrease of 47.5 %) (Table 5).

Since the drastic decrease in phytomass during the drought of 2015 – 2018 the phytomass across the reserve had been increasing annually towards pre-drought

levels (Figure 18). With both rainfall and herbivore density being stochastic it is to be expected that not every area will change at an equal pace, but the drop in phytomass observed this year was unforeseen. As previous reports have shown a correlation between rainfall and phytomass production and considering the quantity of rainfalls received in 2023 (total seasonal rainfall of 613 mm vs long-term average of 418 mm) with late rains in June (Figure 15), the drop in phytomass is unexpected. A possible explanation would be the below average rainfalls observed in 2022, as the previous season’s rainfall seem to have the strongest impact on the current year’s phytomass (Pearson’s correlation coefficient of 0.77).

Table 5. Comparison of phytomass per area, 2022 to 2023.

Area	2022	2023	Delta (kg/ha)	Delta (%)
Cambridge	510,89	388,87	-122,02	-0,24
Ezulwini	1330,22	698,55	-631,67	-0,47
Impalabos	947,21	1034,72	87,51	0,09
Rome	1227,89	926,29	-301,60	-0,25
Average	913,96	699,75	-214,21	-0,23

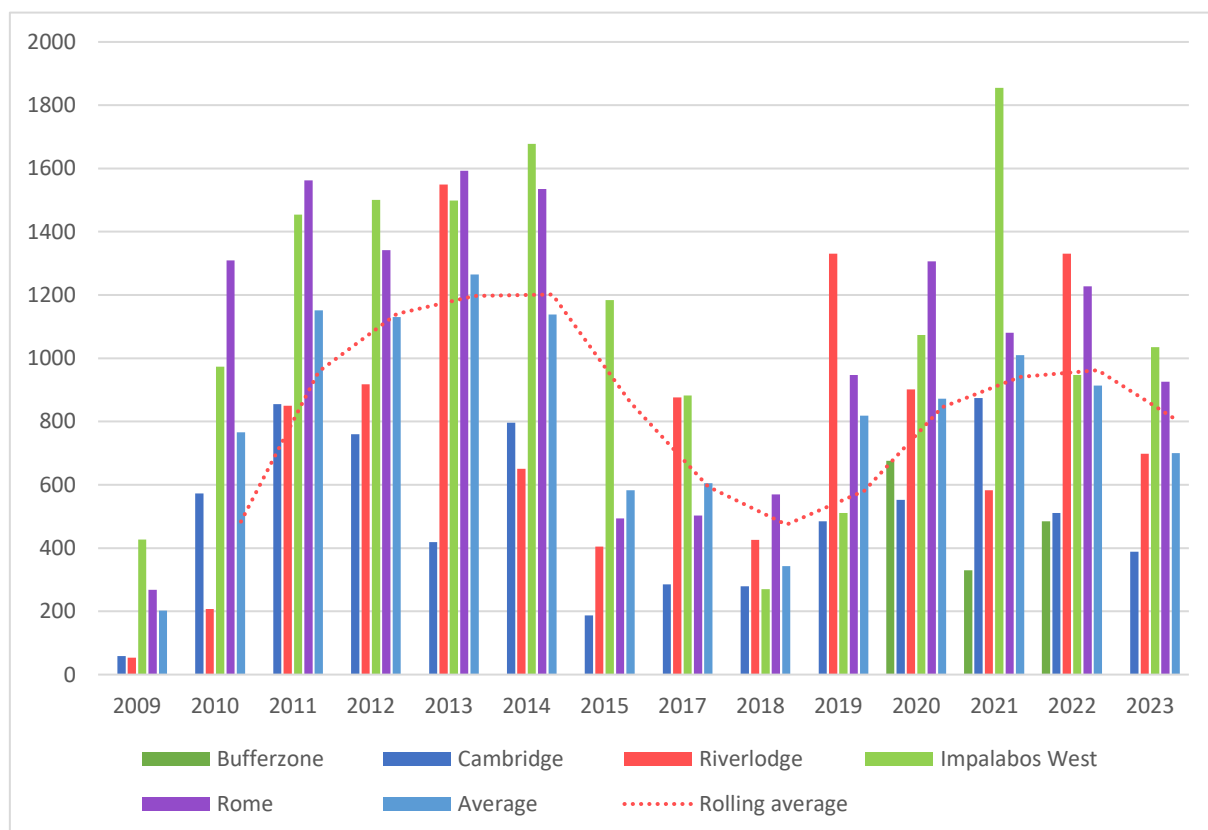


Figure 18. Averaged and regional phytomass in OWRN between 2009 and 2023.

Grass moisture content was relatively high and did not vary considerably among the different plots or amongst the different regions. Indeed, moisture content was however significantly higher than in 2022, with an average of 7.49 % ± 2.65 against 4.40 % in 2022 ± 6.90, and with the lowest moisture content within OWRN being 6.29 % in 2023 against 1.84 % in 2022. This increase in moisture content can most likely be attributed to the exceptionally high rainfall received during the late wet season in 2023 and to the

late rains of June (Figure 15), which highly contrasts with last year's weather reports (Figure 16), that allowed the vegetation to maintain higher moisture content throughout the dry season. This increase has several positive benefits, as with low moisture levels in grass, many grazers, especially water dependent grazers such as Buffalo, require waterholes as they cannot meet their water needs through grazing alone (Western 1975). Low moisture content also increases fire intensity and rate of spread (Govender *et al.* 2006), making the reserve more susceptible to uncontrollable fires. The available phytomass at the end of the dry months can be used for planned burn to clear moribund material, prevent bush encroachment and add nutrients to the soil to coincide with spring rains and the growing season.

Finally, the available data on herbivore numbers across the whole of BNR indicates a significant decline in grazers post drought, and a weak positive correlation was found between herbivory and phytomass (Pearson's correlation coefficient of 0.13) which should not be overseen. Considering the significant decrease in herbivore numbers post-drought and the observed decrease in phytomass this year, continuous monitoring is advised to assess the resilience of the grass species composition and density, and therefore of the veld, post extreme events, and ensure that sufficient grazing is available at all times to sustain the herbivores present on the landscape.

6. Game count

Annual game counts are conducted in order to obtain the most accurate representation of the species within Olifants West Nature Reserve. For many years the same methodology has been employed allowing for consistency in the data and the ability to detect trends over time. Historically, we would compare figures within the whole of the APNR, as an open system is subject to much internal movement.

Changes in densities of animals that are known to be highly mobile, such as elephant and buffalo, are much less easy to interpret. Furthermore, the size of the reserve changes over time, as is the case in OWNr with York 7 joining. For this purpose, it is key to look at densities per ha and biomass per ha across as much of the system as possible. These data can then be compared to primary vegetation production to help understand why species increase or decrease in a given year.

This year the game count was coordinated by Balule Nature Reserve (BNR) and OWNr was covered in 3 days, between 14 and 16 September (Figure 19).

Following the long drought, a strong trend appeared across the whole of Balule, showing a neat increase in elephant densities, buffalo numbers (however remaining below pre-drought densities), and large browsers (kudu and giraffe) and a decline in almost every smaller animal. This is likely linked to the increased impact of the elephants which result in a more open, homogenous landscape, further aided by the saturation of water sources. This will in turn impact the carnivore guild as the change in prey base will benefit hyena and lion at the expense of leopard and meso-carnivores. In 2023, although a further decline of small species (*e.g.*, steenbok, warthog, impala) was indeed observed, the reported numbers of elephants, buffalos, and large browsers in OWNr were lower than in 2022. This was translated by a lower total biomass as

elephants and buffalos have a strong influence on this value, and by a decrease in the proportion of browsers (Table 6).

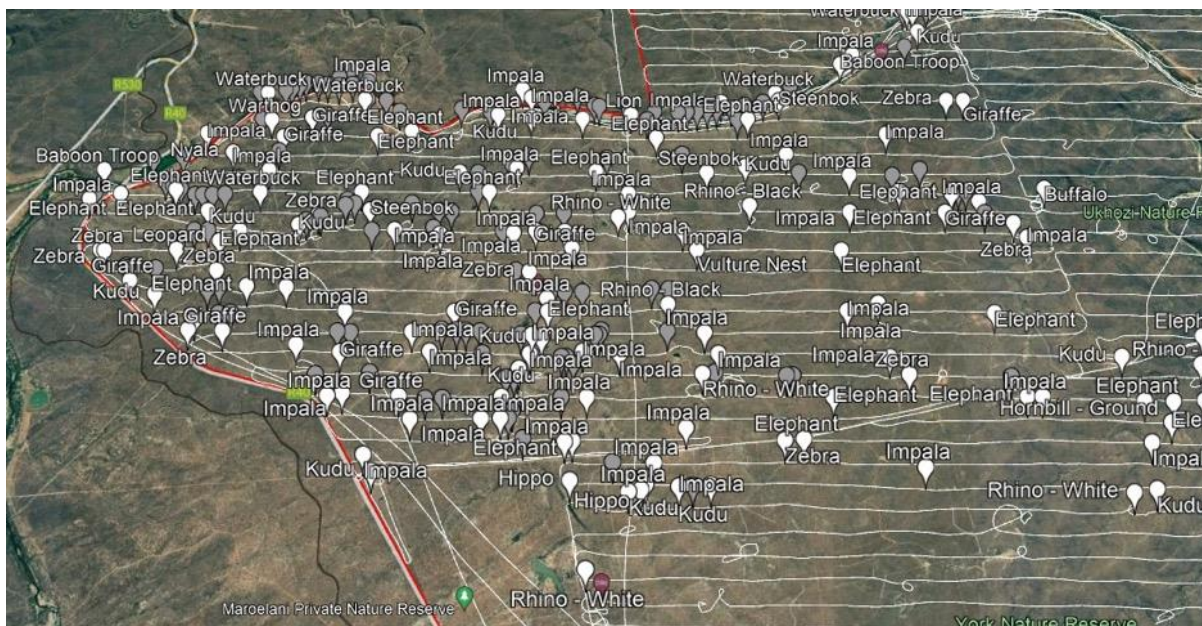


Figure 19. Flightpath of the game count over OWR and animals recorded.

However, it is important to note here that aerial game counts are biased towards certain species and the fluctuation in detection of the smaller animals can be hard to distinguish from the long-term trend. This is further confounded by the fact that BNR has moved away from the method and team that was always employed, with a smaller helicopter, greater distance between the flightpaths and different spotters, all factors that are known to impact the results. Nevertheless, there is reason for concern for species such as blue wildebeest which have been greatly reduced and are unlikely to persist on the landscape for very long.

Table 6. Game count statistics in OWR in 2023 compared to 2022.

Feeding class ¹	2022		2023		Guideline
	% of total nb. of animals	% of total biomass (kg/ha)	% of total nb. of animals	% of total biomass (kg/ha)	
Bulk grazers	16.73%	19.02%	18.62%	26.67%	45.00%
Selective grazers	2.59%	0.04%	2.01%	0.01%	20.00%
Mixed feeders	71.52%	74.97%	72.68%	69.06%	20.00%
Browsers	9.16%	5.96%	6.68%	4.26%	15.00%
Mega herbivores ²	25.15%	88.43%	24.13%	89.49%	
Total	2588	192.99	2035	139.52	

¹Bulk grazers include buffalos, hippos, sables, waterbucks, white rhinos, and zebras; selective grazers include warthogs and wildebeests; mixed feeders include impalas and elephants; and browsers include black rhinos, bushbucks, grey duikers, giraffes, klipspringers, kudus, nyalas, Sharpe’s grysboks, and steenboks. ²Black rhinos, buffalos, elephants, hippos, and white rhinos are considered mega herbivores.

7. Threatened and iconic species

Threatened and iconic species, such as African wild dogs (*Lycaon pictus*), Southern ground-hornbills (*Bucorvus leadbeateri*), cheetahs (*Acinonyx jubatus*) and vultures (e.g., white-headed vultures – *Trigonoceps occipitalis*), are closely monitored in OWNr, and the data is shared to global or regional conservation programs. The data collected for Southern ground-hornbills is shared with the APNR Ground-Hornbill Research & Conservation Project (<https://apnrgroundhornbillproject.com/>), run by the FitzPatrick Institute of African Ornithology and which investigates southern ground-hornbills' habitat use, reproductive success, and behaviour. Their research has for objectives to (1) better understand the ecology of this species, and (2) use this knowledge for conservation purposes, as ground-hornbills are listed as 'Vulnerable' on the IUCN Red list. Vulture sightings, especially of rare and elusive species such as white-headed vultures (44 nests recorded in the Kruger, and 5 in the Greater Kruger), are shared with Endangered Wildlife Trust (EWT), and integrated in the EWT's Vultures for Africa Program (<https://ewt.org.za/what-we-do/saving-species/vultures/>), which aims at protecting vulture species from human impact, such as poisoning, raising public awareness, engaging governments to implement conservation actions, and improving our understanding of the different species to enhance our conservation strategies.

Between January and December 2023, 63 wild dog sightings, 35 ground-hornbill sightings and 2 white-headed vulture sighting were reported (Figures 20 & 21; Table 7). The contribution of lodges and landowners, Transfrontier Africa teams and camera traps was equivalent when the three species were considered together, highlighting the importance of varying data sources when monitoring a wide range of species (Table 7). The Pondoro pack of wild dogs was reported on multiple occasions this year and is now composed of 7 youngsters (out the initial 8 pups) and at least 7 adults, making it the largest pack on the landscape. As wild dogs are social animals that rely heavily on the group to raise young, hunt and defend themselves, the existence of larger groups is essential for their conservation and therefore good news. In addition, a pair of ground hornbills was seen examining one of the artificial nests placed near campfire academy. This sighting was reported to the APNR Ground Hornbill Project team, who carried out an initial survey and concluded that although the birds had brought in nest lining, they were not breeding in it.

Table 7. Endangered species sightings between January and December 2023.

Species	Total Nb. individuals	Number of observations by		
		Lodges & Landowners	Camera traps	Transfrontier Africa
African wild dog	168	13	29	21
Southern ground-hornbill	73	20	1	14
White-headed vulture	2	1	1	0
Total	243	34	31	35



Figure 20. White-headed vulture (left), southern ground-hornbill (center) and African wild dog (right) captured in OWRN between January and December 2023.

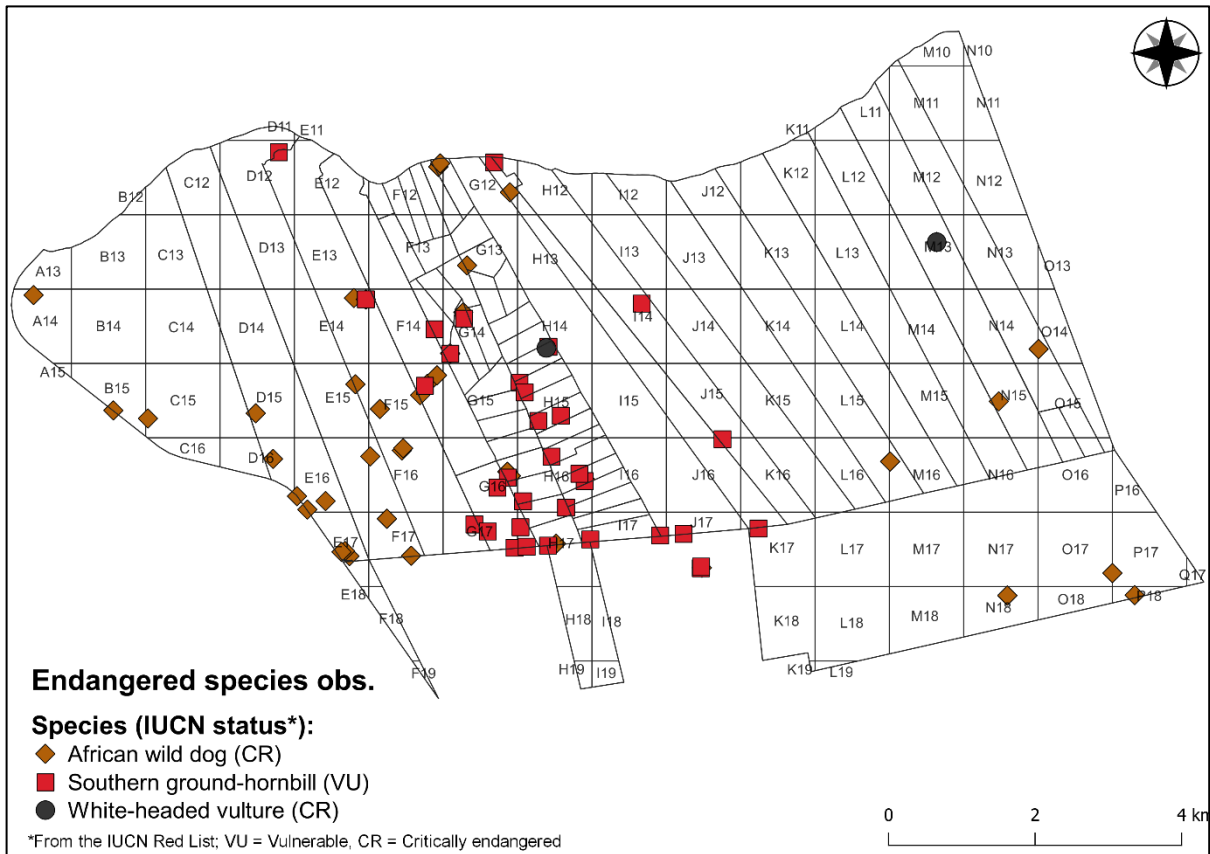


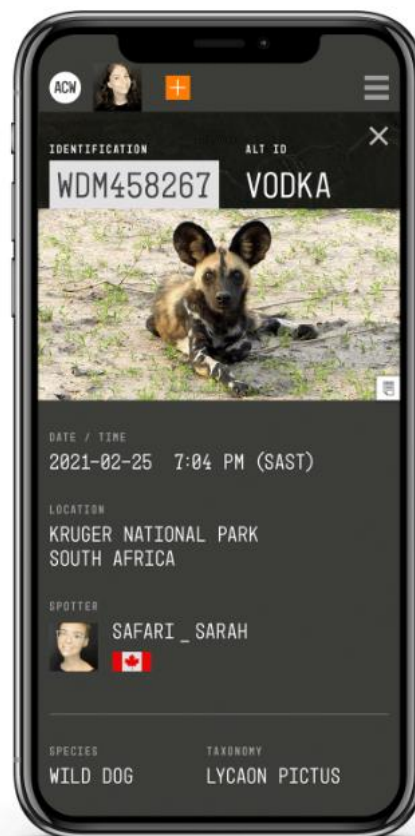
Figure 21. Sightings of endangered and iconic species reported in OWRN between January and December 2023.

8. Apex predators monitoring

In August 2023, a monitoring program of OWR's apex predators (incl. lions (*Panthera leo*), spotted hyaenas (*Crocuta crocuta*), leopards (*Panthera pardus*), African wild dogs (*Lycaon pictus*) and cheetahs (*Acinonyx jubatus*)) was devised and initiated by Transfrontier Africa. The main objective is to better understand their population dynamics, demography, movements, and density, by identifying them to the individual level using camera trap data and citizen science. This will complement the information collected each year on prey densities, veld condition, and predator diet to enable managing authorities to make informed decisions.

OWNR's landowners, guides and tourists will be encouraged to contribute to the project by submitting their pictures to Transfrontier Africa or directly on African Carnivore Wildbook (ACW) platform:

<https://www.africancarnivorewildbook.org/>.



This innovative online platform offers several benefits:

- A space devoted to citizen scientists not only to donate their pictures to research and the conservation of large predators, but also to receive direct and automatic feedback when their individual has been identified by a scientist (e.g., identity, sex, other sightings of the same individual) for registered citizens (free account);
- An online international platform connecting scientists and offering free access to AI software, enabling conservationists to follow the movement, health and behaviour of large predators;

A secure platform to prevent any misuse of sensitive data.

Data issued from our monitoring camera traps, landowners and game drivers, and Transfrontier Africa teams have been collected monthly since August 2023 and will be analysed in 2024 by the Research team and interns.

PART E – RESEARCH PROJECTS

Research is one of the core functions of Transfrontier Africa and is strongly linked to all other areas of the organisation: environmental education and awareness, security and community development and engagement. One of the main reasons for creating Transfrontier Africa was to support management in making informed decisions. TA's Research Department is focusing its efforts on four main research axes, besides the continuous ecological monitoring, under which the on-going, past, and future research projects fall. These four research axes have been selected to meet our obligations to our partners, stakeholders and company values in terms of ecological monitoring, research development, sustainable use of the landscape and wildlife, security, and community empowerment. These four research axes are:

- **Biodiversity and Trophic Interactions**
- **Community Development**
- **Human-Wildlife Conflicts**
- **Criminology**

Each of the four Research Axes includes Research Projects with a wide range of stakeholders involved, project duration and scale of impact. These projects can arise to address local internal needs (e.g., informing management decisions, assessing immediate threats), to develop fundamental knowledge on an innovative ecological or social question, or to address international issues (e.g., human-elephant conflicts). The development of the project, fieldwork, and data analysis are often run by different and numerous parties, from TA's Research Department and TA's director to interns.

This report summarises the research done in the past quarter. More detailed reports, theses and publications on the various projects can be downloaded (<https://ln5.sync.com/dl/23caec5e0/rx6zeq5x-ghqbp7bk-pk8sq6z2-jthsrqxf>).

Alternately, please contact Paul Allin at research@transfrontierafrica.org.

1. Research Topic 1 – Biodiversity and Trophic Interactions

The topic 'Biodiversity and Trophic Interactions' includes research projects related to species diversity, intra- and interspecific interactions, spatiotemporal use of the landscape by animals, and the relationship between wildlife and habitats.

The Grass Biomass Consumption by Insects in a Semi-arid Savanna Ecosystem *Amy Dennet, MSc, University of Brighton*

The savanna ecosystem has been a key landscape for ecological research for decades. Management practices are often implemented with knowledge of the interplay between herbivores and vegetation composition. However, there is an evident knowledge gap as insect herbivory within savanna ecosystems has not been extensively studied to the same degree of other herbivory practices. The aim for this project is to create a deeper understanding of insect herbivory of grasses within a semi-

arid savanna, to understand how this compares to mammalian herbivory, and to identify insect feeding habits.

Through a one season exclusion experiment in a semi-arid savanna, this study tested the hypothesis that insect herbivory on grasses in African savannas is substantial and is likely an important driver of the ecosystem.

The research objectives to support the hypothesis are as follows:

1. Determine if the percent of damaged leaves caused by insect herbivory is comparable to that of mammal herbivory.
2. Evaluate whether leaf age influences insect herbivore consumption levels.
3. Elucidate which grasses are being consumed by mammal herbivores compared to insect herbivores.

The results from this study provided evidence that mammal herbivores remove significantly more of the leaf matter than insect herbivores ($z = 76935.00$, $p < 0.001$); leaf age has no effect on how it is utilised by insect herbivores ($H = 17.13$, $p > 0.05$); and lastly, the results suggest that insects and mammals consume different grass species to each other ($R^2 = 0.055$, $t = 0.450$, $p = 0.668$).

Grass Preference of Arthropod Herbivores in The Savanna Biome

Joris Kors, BSc, Van Hall Larenstein University of Applied Sciences

There is a lack of research done into insect herbivores, and especially into their food preference. This is quite strange as insects make up the biggest part of the biomass of all animals on this planet (Milo & Phillips, 2018). Because they make up the biggest group of animals according to biomass, you would expect them to also have quite a big amount of biomass they consume as food. If this is the case, this could also have an impact on other animals and organisms. In this research the focus is on the insect herbivores. If they indeed have a high biomass consumption, they could be an important factor in the ecological carrying capacity.

The ecological carrying capacity is calculated to see how many animals can be sustained in a specific area, multiple factors are accounted for in these calculations (Wu & Hu, 2020). However, insect herbivores are generally ignored in the calculations for the ecological carrying capacity. The aim of this research is to figure out if insect herbivores prefer certain types of grasses.

Firstly, the Jacobs' index is used to see if insect herbivores have a preference in their food source. The results of the Jacobs' index show that insect herbivores indeed prefer certain types of grasses. There are 4 grass species that they prefer to consume, since these grass species have an index score between 0,5 and 1. These grass species are *Aristida stipitata* (0,9294 per leaf and 0,7787 per sample), *Brachiaria deflexa* (0,9709 per leaf and 0,9557 per sample), *Tragus berteronianus* (0,8932 per leaf and 0,8852 per sample), and *Tricholaena monachne* (0,9213 per leaf and 0,8717 per sample). Furthermore, these grass species all have a grazing value score of 4 out of 10 or lower (Transfrontier Africa, 2023). Which means that the insect herbivores prefer different types of grasses than mammalian grazers, since mammalian grazers prefer grasses with a higher grazing value (Treydte et al., 2013). This in turns means that the insect herbivores grass consumption might not have as big of an impact on the carrying

capacity because their preferences do not overlap. Lastly, the collected data is compared to another area in the region, the alluvial flood fields. This is done to see if the research area is comparable to different areas, so the results from this research are applicable to different areas. Which is the case, the Welch's t-test shows that there is no significant difference between the research area and the alluvial flood fields ($p=0,115$ and $p=0,251$).

Effectiveness of Alien Vegetation Control

Leon Lunow, BSc, University of Sustainable Development Eberswalde, Germany

Every year, we spend significant resources on detecting and combating alien vegetation across the OWN landscape. It is therefore important to determine the efficacy of our actions and, if need be, to adapt to improve. Leon's research focusses on how effective the biocontrol and herbicide are at killing *Opuntia sp.* (prickly pear), the most abundant, widespread alien in the reserve. We know that the plants are very resilient and can resprout after infection. The rate of survival post treatment has not yet been measured. Leon's preliminary findings show interesting results: only 14 % of the 108 plants he revisited were dead, but 69 % of the ones previously treated with cochineal bugs were still infected. Although the herbicide initially appears to be more effective at killing the plants, over time it seems to become less effective where the biocontrol appears to become more effective ($p<0.05$) (Figure 1.a). This could indicate that the biocontrol takes time to establish and kills the plant slowly where the herbicide quickly damages the plant but over time it does resprout.

Figure 1.b shows that there is no significant difference in resprouting over time ($p=0.18$). However, the season of application of biocontrol has a strong relationship to how successfully the biocontrol will spread to resprouting cladodes, with wet season being significantly lower (25-40%) than dry season application (75%). This is most likely due to the fact that the biocontrol can be washed off the host plant in rains. Application during the end of the dry season is likely to be the best option as it will allow the bio control to spread across the host and infect new growth during the wet season. Further experiments and research will be needed to explore these findings in more detail and these findings will need to be incorporated into our treatment protocol.

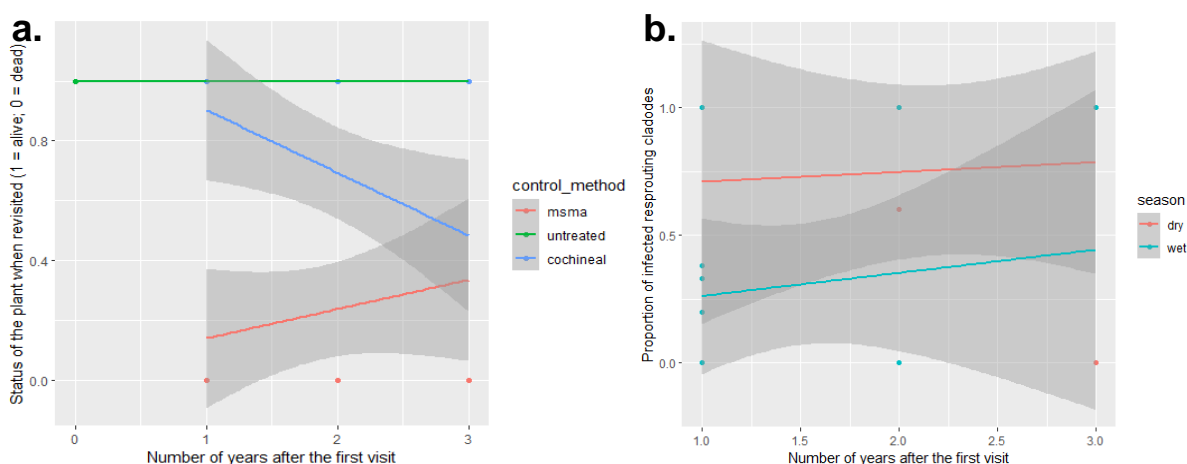


Figure 1. Efficacy of the treatment over time (a), and seasonal impact on the persistence and spreading of the biocontrol (b).

Grass Succession Post Drought

Ilka Meier, BSc, University of Sustainable Development Eberswalde, Germany

Grass species composition has a large impact on the ecosystems' ability to sustain faunal biomass. The composition of species is not static and changes after disturbances, such as grazing, burning and drought. Generally, significant disturbances negatively impact the quality and quantity of grasses, specifically leading to a reduction of perennial, tufted grasses. In extreme disturbances all vegetation may be removed and the bare ground then will be colonised by pioneer species. Under good conditions, through the process of succession the pioneer grasses will be replaced by sub-climax and climax species increasing the overall capacity to support animals. However, if the conditions are not good post disturbance, the overall system can become degraded and support fewer animals than before the disturbance.

From 2015 to 2018 we experienced a long and severe drought which had a significant impact on our grasses. Ilka collected the grass data for 2023 and analysed it together with the other post drought years to see if there is a detectable succession of grasses over time and which factors are impacting this. Figures 2.a and 2.b show a clear positive correlation between the increase in rainfall and both the diversity ($p < 0.01$) and succession ($p < 0.01$) stage of grasses. This is also true for the species richness and perennality of the grasses. On figure 2.c, a clear decline ($p < 0.001$) in bare ground with increased rainfall is shown.

Because rainfall and herbivory are strongly correlated, we will need to look into how best to separate the two drivers to understand the causality. Overall, it is good to see that after such a severe drought the grass community is still resilient enough to rebound strongly under favourable conditions.

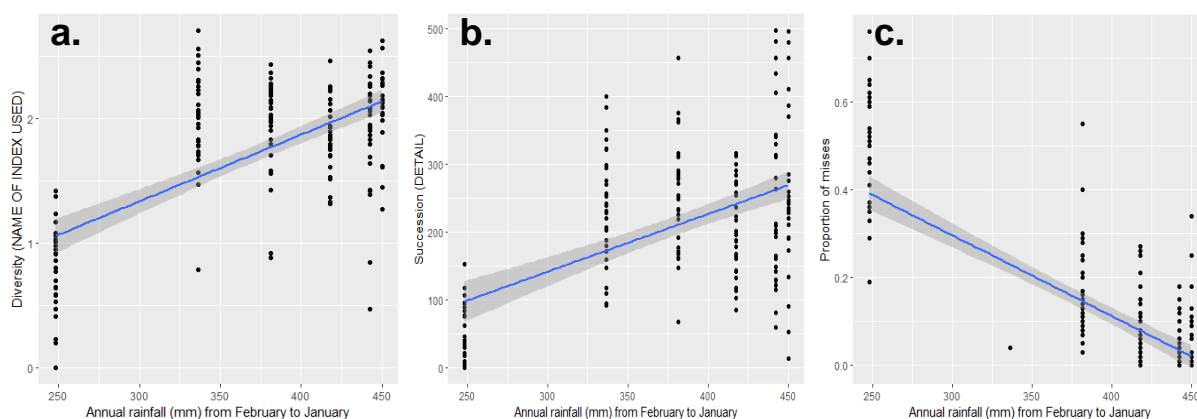


Figure 2. Effect of the annual rainfall (in mm) on the diversity of the grasses surveyed (a), the successional stage of the grasses, with lower values indicating pioneer grasses and higher values climax grasses (b) and the ratio between bare ground and grass (c).

Grass and soil N and P post burn

Promise Willhite, BSc, West Kentucky University, United States

Fire is one of the important drivers in the savanna ecosystem and occurs both naturally and as a management tool. As a management tool, fire is typically employed to remove moribund, which reduces the chances of unplanned burns and allows for new plants

to grow, and to speed up the nutrient cycle allowing for more nitrogen and phosphorous to enter the soil and become available for plant growth. This nutrient cycle has not been studied before on OWNR and we are keen to understand how long the increased nitrogen and phosphorous persists in the soil, and therefore how long post burn new vegetation may benefit from the burn.

October 2022 saw the first planned burn in OWNR and this allowed us the opportunity to study this process.

Perpendicular to the edge of the burn three transects were chosen along which grass and soil samples were collected in the burnt area as well as directly opposite as a control. The samples have been sent to a lab for analysis and will be resurveyed in the middle of summer 2024 to see if there is still a detectable difference between the burnt and unburnt areas.

Rodent abundance and diversity post burn

Natalie Heath BSc, West Kentucky University, United States

Fire can be a very destructive process in the savanna. Most large mammals can flee a fire easily, smaller mammals however are generally not able to do so and can be locally extirpated by a fire. Rodents are typically strongly affected by fire and most will not survive. This study looks at the post burn recovery of rodents as an indication or recolonisation speed.

Along 3, 200m transects perpendicular to the edge of the burn in the burnt area and 3 control transects opposite the burn, a small Sherman rodent trap was placed every 20m and a large trap every 60m. The traps were baited and checked the following day for 3 consecutive days every week for 4 weeks. Any rodents captured were measured, ID-ed, weighed and marked to account for recapture as an indicator of density as well as occurrence. Once the analysis is complete we will better understand the impact of fire on the rodent community which impacts the rest of the biodiversity and will help management plan burns in future.

Most effective eDNA sampling methods for biodiversity assessment

Louise Jokobson and Nete Zielke MSc, Aalborg university, Denmark

Environmental DNA (eDNA) are small pieces of DNA that are released through e.g. hair, skin and saliva (Ruppert et al., 2019). The use of eDNA for monitoring has gained ground through the recent years, especially regarding marine- and freshwater monitoring and in soil samples (Rees et al., 2014; Kuntke et al., 2020). The method is gentle on the environment and organisms, and has shown great potential in regard to conservation biology (Lynggaard et al., 2022a; Lynggaard et al., 2022b; Kalivodová et al., 2018). It is possible to detect species through analyses of the collected eDNA, which is more time and resource efficient compared to conventional monitoring methods (Lynggaard et al., 2022a; Lynggaard et al., 2022b). The latest development is using airborne eDNA to monitor terrestrial species (Lynggaard et al., 2022a; Lynggaard et al., 2022b; Clare et al., 2022). A study from the University of Copenhagen tested monitoring of vertebrates using airborne eDNA in a Danish forest. They found

64 different taxa, of which 57 were considered wild. They estimated that this is roughly 1/4 of the species that live in the overall area (Lynggaard et al., 2022b).

Airborne eDNA has not yet been tested in warmer natural climates. This is essential though, as previous studies show that small increases in temperature entail large effects on detection and degradation of eDNA (Moyer et al., 2014). This study aims to investigate the use of airborne eDNA for monitoring in the South African savanna. Airborne eDNA is an ideal method for the savanna, as this is a large natural area that is difficult to monitor with e.g. camera traps. Additionally, this study facilitates the continued development of airborne eDNA sampling.

To assess the potential of the method for wildlife monitoring in this environment, three methods for eDNA sampling are used in this study. Airborne eDNA was collected using a drone and eDNA was collected from dust around and from water at waterholes. The eDNA is now being processed at the university and the results of eDNA methods will be compared with data from camera traps to identify the method that yields the most accurate biodiversity.

Apex Predator Diet Identification through Scat Analysis

Tom Beverwijk, BSc, Van Hall Larenstein University of Applied Sciences

The majority of biodiversity loss can be attributed to habitat destruction and the decline in habitat quality (Pimm & Raven, 2000). The altering of habitats has a large impact on flora and fauna in this area, and may lead to changes in species density and composition as well as extinction over time (Laurance, 2010). Carnivores are often attributed a high conservation value and play large roles in terrestrial ecosystems and numbers of carnivores are often linked to available prey species and biomass (Hatton et al., 2015). That is why carnivore dietary studies are of high importance to better understand the ecology of predators and the effect on ecosystems (Monterroso et al., 2018).

A total of 17 plots were sampled in 2023. During this period any scat that was found during fieldwork was collected opportunistically and added as additional samples. Each sample was crushed in a tupperware container and mixed to ensure the scat was uniformly distributed in the container. Randomly 18 pinches were taken from the crushed scat. From each of those pinches, 2 hairs were extracted. Collected hairs from each sample were cleaned first by being placed into distilled water followed by 96% ethanol for a few minutes each.

In total 1129 hairs were retrieved from the scat samples and subsequently identified. The number of hairs which were positively identified was 1019 for all of the four apex predators combined. For 110 hairs it was not possible to come to a positive identification, either because of the high degree of damage to a hair or, to a lesser extent because of an insufficient imprint. In table 1 an overview is given of the number of hairs and the number of positively identified hairs.

Table 1. Identified hair of prey species per apex predator.

Prey species	Hyena	Leopard	Lion	Wild dog	Grand Total
Aardvark		3			3
Buffalo			2		2
Bushbuck	45	22	32	9	108
Civet		4			4
Duiker	32	3	8	6	49
Genet	3				3
Giraffe	25		14		39
Impala	220	41	76	19	356
Klipspringer	1				1
Kudu	14	4	17		35
Nyala	15	3	3		21
Steenbok	40	3			43
Scrub hare	3				3
Vervet monkey		6			6
Warthog	3	1		1	4
Waterbuck	24			9	24
Porcupine			3	1	3
Zebra	24	5	7	7	43
Grand Total	449	95	162	52	758

The largest proportion of the diet of the hyena is made up of impala (41,5%), followed by bushbuck (8,5%) and Steenbok (7,5%). Notable species of which hairs were found in the 2023 samples are the genet (0,6%) and the klipspringer (0,2%) which are not commonly found in scat. the largest part of the leopard diet in 2023 consisted of impala (37,6%) followed by bushbuck (20,2%) and vervet monkey (5,5%). Notable species found in 2023 samples were aardvark (2,8%), civet (3,7%) and vervet monkey (5,5%). For the lion the main part of the diet in 2023 also consisted of impala (40,9%) followed by bush buck (17,2%) and kudu (9,1%). A notable species found in the 2023 samples for lion was porcupine. When compared to relative abundance we see if apex predators are actively selecting or avoiding prey species, this is shown in figure 3 below, where the Jacobs' index is given. A value of 0 indicates no selection or avoidance, positive values indicate selection and negative values indicate avoidance.

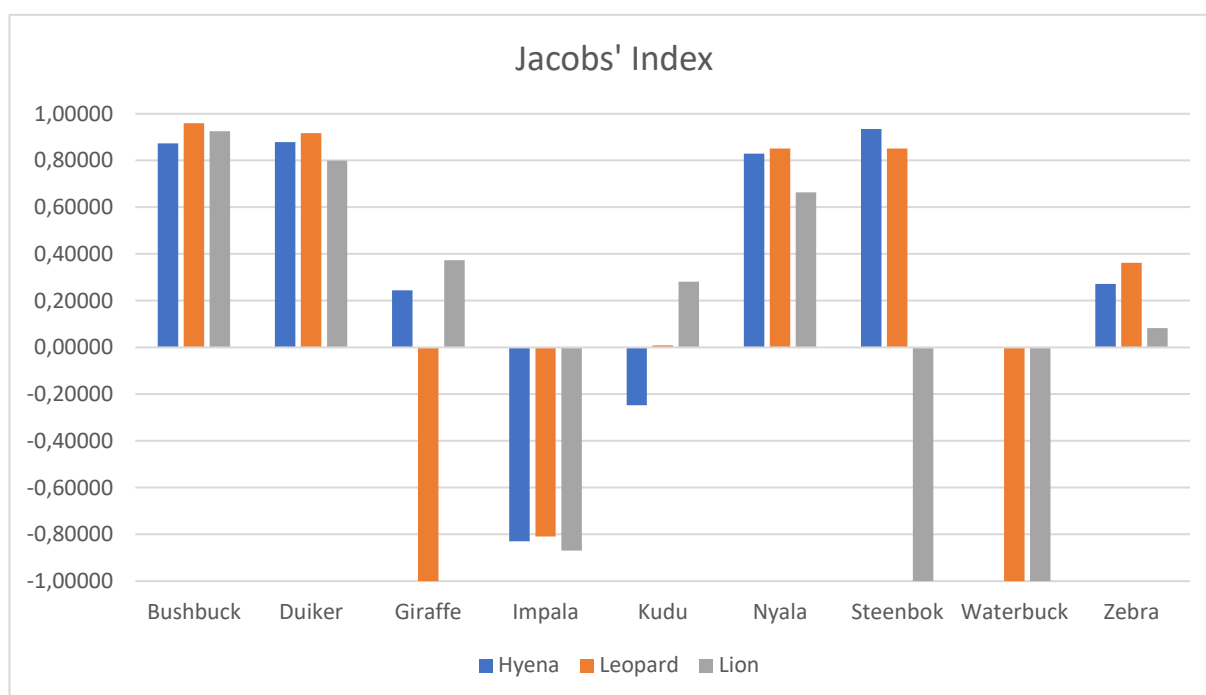


Figure 3. Jacobs' index of prey species for which we have census data, per predator.

Improving accuracy and precision of aerial census in the savanna biome, using remote sensed imagery and machine learning

Paul Allin, PhD, Stellenbosch University

The most widely used method for animal censuses in large protected areas is aerial counting. Numerous studies have been conducted to establish both the accuracy and precision of these techniques over the last 50 years (Caughley, 1974; Colefax et al., 2018; Davis and Winstead, 1980; LeResche and Rausch, 1974; Redfern et al., 2002) and show that the current methods are limited in their ability to reliably detect population trends, both spatially and temporally, which impedes informed decision making (Reilly et al., 2016; Smart et al., 2004).

These issues become especially problematic when dealing with very low densities of animals, for which it is essential to have reliable data (Prosekov et al., 2020). A major factor propagating error in the current methods is human error (Caughley, 1974; Reilly et al., 2016), which can be eliminated to a large degree by utilising machine learning. In addition to the limits in reliability, the costs of manned aerial censuses are high and impede regular and repeat censuses that are required for adequate statistical analysis of population growth (Bonenfant et al., 2009; van Gemert et al., 2014).

The aim of this study is to improve and integrate current machine learning, image recognition and remote sensing methods to develop a fully automated census technique for medium- to large-sized mammals in African savannas that is more accurate and precise, cheaper and faster to execute than current methods. We will train a machine learning algorithm on drone-derived high-resolution remotely-sensed RGB (red green blue) and thermal to automatically identify large mammals at a species level in Olifants West Nature Reserve, Limpopo, South Africa.

In order to develop the algorithm, multiple replicates of the various breeding camp enclosures will be surveyed under different conditions both in the wet and dry season, to obtain the training data. For the algorithm to be able to identify animals per species it will need to be trained using data for each of the species in the study. These data will be labelled per species to aid in the speed and precision of the training. This not only allows the training and testing of an algorithm, it also allows for a comparative study of accuracy and precision between the traditional method of helicopter counting a the new machine learning algorithm. The data for this first phase were collected in September and October and the algorithm is currently being trained.

2. Research Topic 2 – Community Development

The topic ‘Community Development’ includes all the research needed to investigate the effects of the Bush Babies and Black Mambas programmes in the surrounding communities and their perception of wildlife, conservation, and poaching.

Marula seedling predation

Chris Banotai, PhD, Wyoming University

In the final chapter of this research, the focus is on the perception of community members towards Marulas, their cultural and medicinal value and if neighbouring communities can be seen as a benefit or a threat to marula trees. Chris conducted semi-structured door-to-door interviews in Maseke, Namakgale and Makushane in order to obtain a representative view of how community members view trees in general and Marula specifically. These data are currently being analysed.

3. Research Topic 3 – Human-wildlife conflicts

The topic ‘Human-Wildlife Conflicts’ includes all the research needed to mitigate human-wildlife conflicts in the landscape and surrounding areas, and to develop conflict mitigation methods that could be used throughout Africa, or in other continents facing similar human-wildlife conflicts to reduce both human losses/injuries and structure/crops damages caused by wildlife, and the human impact on wildlife populations. This axis includes behavioural studies of species involved in human-wildlife conflicts, pilot studies testing innovative conflict mitigation methods, the monitoring of both human and wildlife spatiotemporal use of the landscape and the impact of human infrastructures, transports, and pollution on wildlife populations demography.

The End of the Line: Understanding Elephant-Train Collisions in Balule Nature Reserve, South Africa

Sarah Cox, Msc, University of Manchester

Every year multiple elephants are hit by trains running through Balule Nature Reserve, resulting in their deaths. Knowledge of ‘high-risk’ collision zones and the parameters

which increase elephant-train collisions (ETC) likelihood in Balule are both required to optimize management impact in key areas, but pertinent information is limited due to significant gaps in scientific literature along the lines of involved-vehicle type, location, and focal species.

The primary aim of this study is to develop a better spatiotemporal understanding of elephant-train collision frequency in Balule Nature Reserve. This aim is split into 5 objectives:

1. Identify rail crossing hotspots,
2. Identify spatial, temporal, and biological factors which influence rail-crossing likelihood,
3. Evaluate how crossing-parameters may vary between groups of elephants exhibiting Frequent, Infrequent, and Never- crossing behaviour in order to better understand risk-factors predictive of crossing behaviour within the elephant population,
4. Identify elephant-train collision hotspots,
5. Identify spatial, temporal, and biological factors which influence rail-collision likelihood.

Utilising satellite collar data from 39 elephants, the animals are split into three main groups based on their crossing frequency: never (4), sometimes (21) and frequent (14). Each of these groups are then analysed for location, time, season to see if there are specific differences and drivers for the crossings. Following this, the ecological drivers are then tested for correlations with the crossings; distance to water, distance to ‘safe’ crossing location, topography, and energy requirements. These data are then compared to the collision data we have and corrected for relative time spent at the railway (Figures 4 and 5).

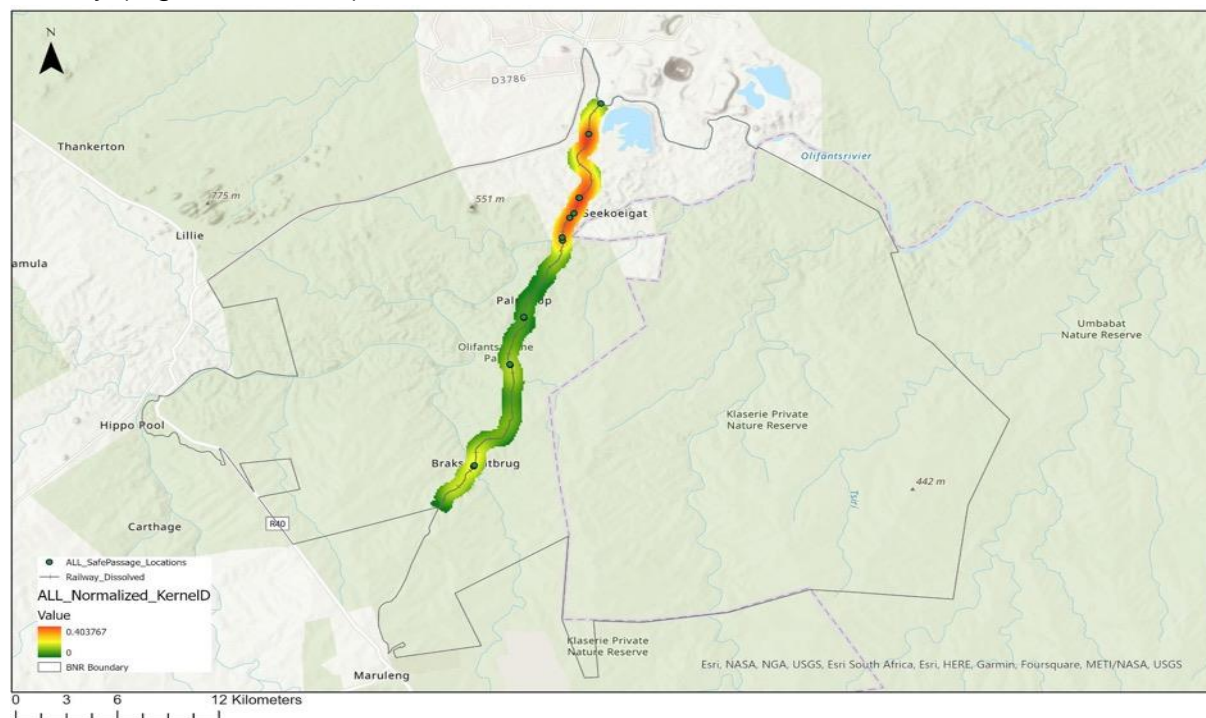


Figure 4. Elephant crossings, normalised, with red indicating the most crossings and green the fewest.

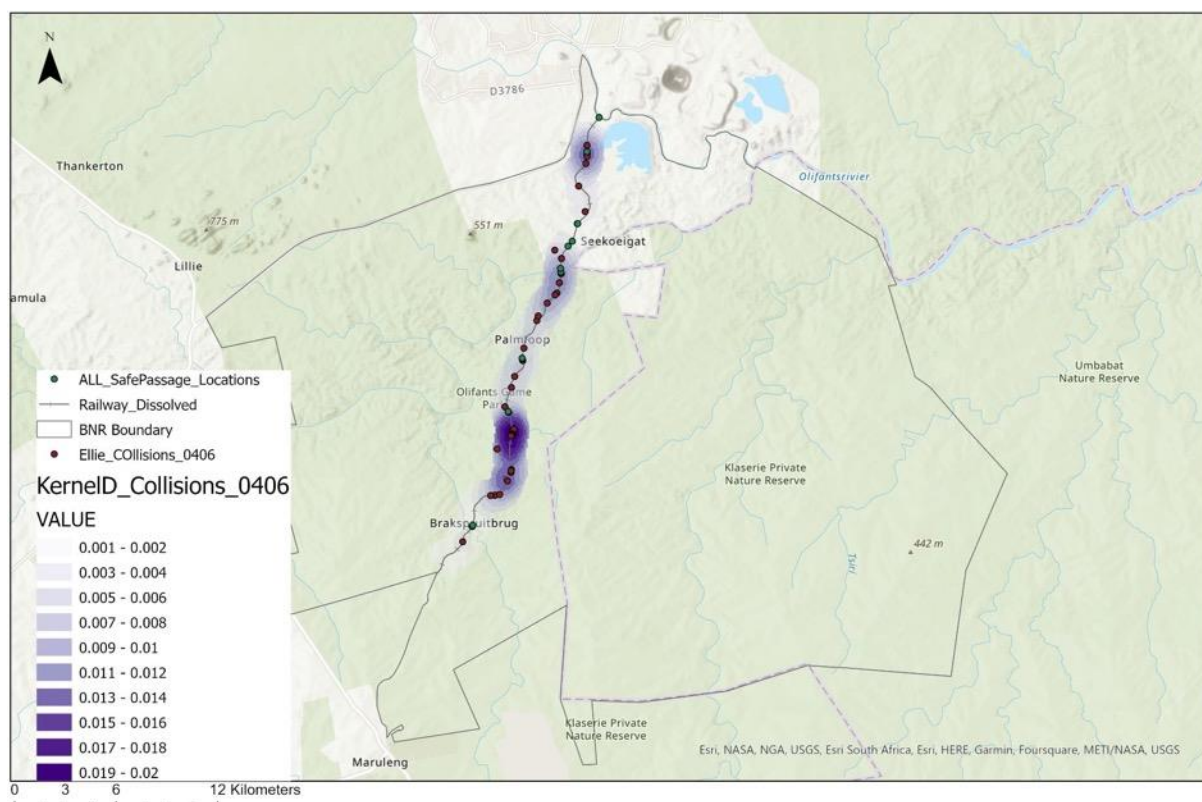


Figure 5. Fatal elephant collisions; the darker the colour the greater the number of collisions.

Factors Affecting Mammal Utilisation of Non-Wildlife Railway Underpasses within the Greater Kruger, South Africa.

Hannah de Villiers, MSc, University of Witwatersrand

Railways are an integral component of sustainable transport systems, but cause significant impacts to biodiversity, primarily through wildlife-train collisions and the habitat fragmentation created in the landscape. Crossing structures (CSs) for wildlife are the key mitigation measure for these adverse impacts, which will be critical throughout Africa, where 85,000 km of new railway lines are predicted to cut through hundreds of protected areas.

For the first time in southern Africa, mammal usage of railway underpasses that were not designed to facilitate wildlife movement was studied using camera traps in the Greater Kruger National Park, South Africa. This study demonstrates that 70% of the terrestrial medium and large mammal species present in the area used at least one non-wildlife CS during the study period, with a total of 1,823 usage events by 33 species. Twelve medium to large African mammal species used underpasses regularly, improving the permeability of the railway line for these species.

A viaduct design was characterised by almost four times the usage rate of a typical box culvert and was used by twice as many species, including megaherbivores and mesoherbivores, whereas box culverts supported a smaller number of species, of which the majority were predators. Species most affected by rail collisions in the study area were mostly herbivorous and seldom used non-wildlife underpasses

(e.g., impala, (*Aepyceros melampus*), greater kudu (*Tragelaphus strepsiceros*), and African buffalo, (*Syncerus caffer*)).

These results indicate that a railway line with only drainage culverts and the occasional viaduct is not effective in providing adequate safe crossing structures for megaherbivores and ungulate mesoherbivores. Contrary to expectations, vegetation and environmental factors influenced mammal usage of box culverts more than structural dimensions. Ensuring that there is high visibility through the structure, with less herbaceous cover and more woody cover outside of entrances, is likely to enhance culvert usage by most trophic groups. In a savanna context where faunal diversity is high and no single species is a target for mitigation, a range of underpass designs including larger viaducts, located in different types of vegetation cover, thereby combining the range of requirements of different guilds, is recommended.

4. Research Topic 4 – Criminology

The axis 'Criminology' includes all the research needed to understand and prevent illegal wildlife trade, with a focus on the prevention of poaching. This axis includes socioeconomic studies in communities surrounding nature reserves, spatiotemporal studies of poaching patterns, studies to evaluate the effectiveness of anti-poaching methods used and pilot studies to test new methods for detecting and preventing poaching in nature reserves. This axis therefore uses interdisciplinary science, building on sociology, criminology and biogeography, to provide holistic and comprehensive answers to scientific and security questions.

Automation of Daily Security Report and Integration of Sensing Clues in the Existing Workflows.

Jente de Schepper, MSc, VIVES Universtiy of Applied Science, Belgium

Last year we started using a new tool for the logging, analysing, and reporting of illegal activity. This is a very new product that we are helping develop and adjust to our specific needs. Sensing clues is a platform that can incorporate many forms of data, including data from their own app, Cluey, which we use to track all our patrols and record any observations. Although the platform has powerful tools for analysis, there is also a need for frequent reports on where the Mambas have been, what has been found and where the next day's patrols need to be deployed.

Jente has initially focused on the needs of all the stakeholders within TA and following that has been working closely with the developers of Sensing Clues to optimise the software to our needs. In April she will organise a workshop with all the Black Mambas to teach them how the app works, what the agreed protocols are and how the OPS room can use the tools. After this she will be able to start automating the data in the form of a daily report and potentially also other reports. Below are some examples of the analysed data from Sensing Clues that will be included in the reports (Figure 6). These will be combined in one document and automatically emailed to the relevant people.

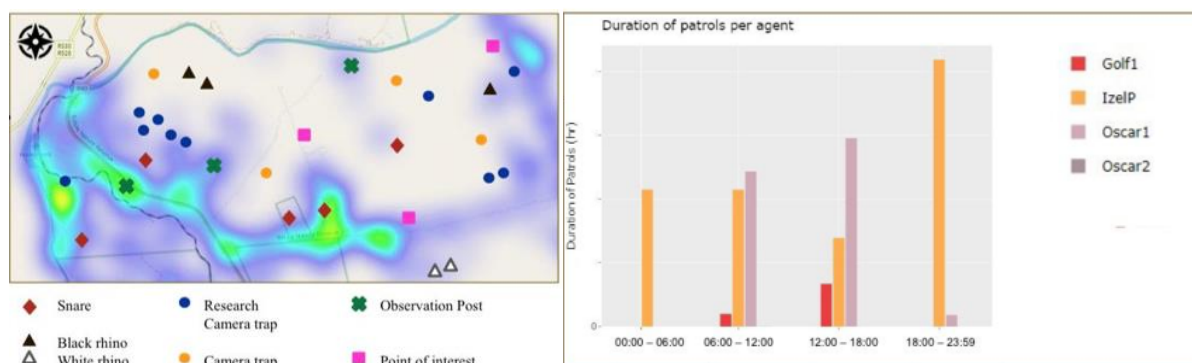


Figure 6. Patrol density over time with observations logged per type of observation (left) and summary of when each team was patrolling in the last 24hrs (right).

A Multifaceted, Non-Militarised Approach to Security Dynamics in Protected Areas: From Foot Patrols, to Tourism, and Local Communities.

Monique Sosnowski, PhD, John Jay College of Criminal Justice

This study was split into 3 main parts, the first strove to understand the relationship between unarmed foot patrols as a form of formal surveillance and bushmeat snaring within the Olifants West Nature Reserve (OWNR). Ranger-based monitoring data was analyzed alongside geographic data supplied by the park to identify the spatiotemporal dynamics of snaring and the environmental factors that impacted the location of snare detections; to develop threat maps demonstrating the risk of snare detection based on the identified environmental factors; and lastly, to investigate the relationship between various management actions (such as the number of patrols and the location of ranger posts) and snaring dynamics. To do so, geographic hotspot analyses were performed in QGIS alongside a variety of statistical analyses, such as Global Moran's I calculations, suitability modelling, and negative binomial regressions. The results of these analytic techniques allowed for the identification of prominent snaring hotspots in the northwestern border region and patrolling hotspots in the southwestern boundary region of the reserve; as well as the environmental factors associated with these hotspots. Examinations of the relationship between snaring and patrolling emerged as weak, with no significant statistical results, leaving room for tactical improvement. Based on these results, and the strong concentration of snaring activity within the park, it was suggested that formal surveillance efforts could be altered from the current management strategy to one of informed by hotspot policing in an effort to more effectively reduce snaring activity. To facilitate such efforts, a ranger picket might also be considered for establishment within the current poaching hotspot.

The second research study explored whether tourism played a guardianship role in regards to bushmeat snaring in OWRN. Tourism was broken down into five variables that considered both tourist lodges and game drives. Game-drive specific variables pertained to the location and length of game routes, while lodge-specific variables considered the locations of lodges and local staff buildings within the park; the volume of visitors was also examined temporally. These variables were derived from RBM, with geographic and tourism records also supplied by OWRN management. While data limitations prevented the application of regression modelling, exploratory data analysis, bivariate correlations, and geographic analyses provided significant insights into the

relationship of these tourism infrastructure variables to snaring. While there was no relationship detected between guest influx and snaring, lodges and buildings appeared to provide somewhat of a protective barrier to snaring; snares appeared in larger quantities farther away from the lodges. Roads, however, possibly due to their sheer density within the park, did not present any level of protection; snares appeared in large quantities very near to the roads. Yet, these relationships between tourism infrastructure variables and snaring were weak; bivariate correlations did not produce significant results.

The third research study – aimed to address the relationship between the local park communities and natural resources. More specifically, it explored potential factors that might be leveraged for the implementation of situational crime prevention measures, if deemed necessary. Surveys were deployed and analyzed using mixed methods. Survey responses indicated that trees and water were the natural resources most utilized, with little to no mention of animals being extracted from the park. There was also a strong community sentiment of concern over the natural resources. Humans were seen as posing the greatest threat to the resources. Deforestation, pollution, mining, poaching, and overuse or misuse were amongst the major human activities of concern. Given the community's concerns and impoverished status, select interventions under the situational crime prevention categories of reducing provocations and removing excuses were eliminated for use, while others were recommended as potential measures.

Spatial-temporal Predictive modelling of Black Rhino on OWNR, SA

Erwin, MSc, Wageningen University, Netherlands

South Africa contains the largest population of black rhinoceros (*Diceros bicornis*) in Africa. With increasing poaching activities in recent decades, mainly within regions near the greater Kruger, more protection and conservation efforts are required, leading to higher conservation costs. Consequently, there is a need for innovative utilization of knowledge on the movement, behaviour, and habitat use of the black rhino to protect this endangered species more (cost)efficiently. This study presents a random forest model for predicting black rhino sightings within Olifant West Nature Reserve.

The model captures intrinsic relationships between various features and the probability of a black rhino sighting. Building upon the conventional random forest model, a weighted random forest model was developed, and a probability map based on the weighted algorithm was generated (figure 7). By assigning higher weights to more recent sightings and proportionally lower weights to older sightings, the weighted random forest model effectively balances the contribution of each observation. This approach considers the importance of most recent sightings in contrast to sightings that might have been years ago. Ensuring that the model dedicates enough attention to areas with recent sightings, which are of great interest when predicting the location. Features were analyzed per grid cell to visualize the influence per feature on the probability of a rhino sighting using the LIME package, as shown in figure 7 below.

The random forest model and weighted random forest model were tested in their predictive capabilities using data from black rhino sightings in the Olifant West Nature

Reserve from June-2023 until August-2023, to test and analyze the predictive accuracy of each model (table 1). The random forest model had an accuracy of 79.4% (100 –

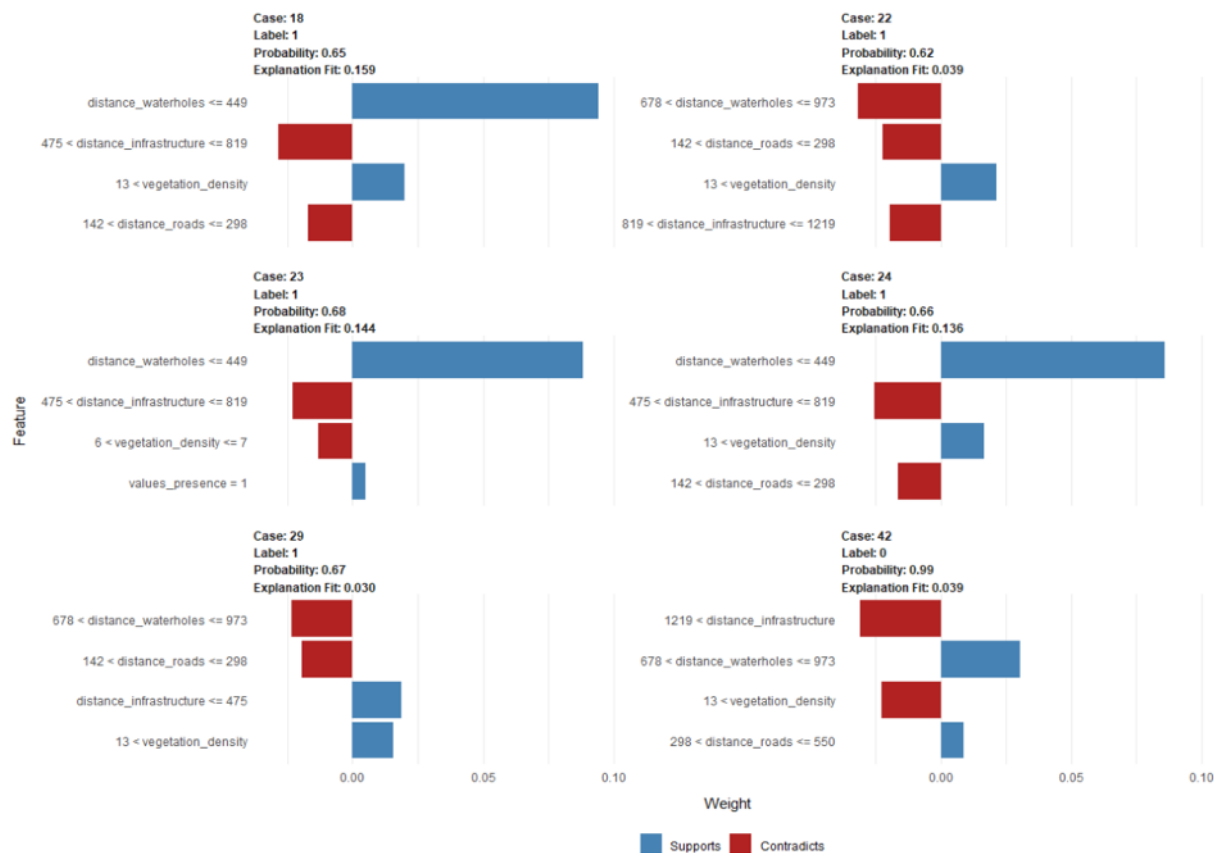


Figure 7. Feature importance per grid cell visualized. Features that have positive correlations with the probability in blue, negatively correlated features in red.

20.6% error rate) in predicting the correct value per grid cell in the tested data. The weighted model had an accuracy of 80.3% (100 – 19.7% error rate).

The process of developing a model is an iterative process that should be fine-tuned and validated in the field. This model holds promise for (cost-efficient) conservation efforts in the future and for protecting this endangered species from poaching.

PART F – NETWORKING AND PARTNERSHIPS

Transfrontier Africa is supported by / works in collaboration with national and international universities, researchers, institutions, and organisations. The organisation also occasionally attends networking events, such as conferences, governmental meetings, or award ceremonies, during which new collaborations can be built, and our work presented to the world. This wide network of transnational collaborations leads to the creation of large-scale projects contributing to the global effort in conservation.

1. National & international collaborations

During the past quarter, Transfrontier Africa took part in 4 collaborative projects with both national and international partners (Table 1).

Table 1. Collaborative projects with partners, and participants from TA.

Partner	Collaborative project
Elephants Alive	Elephant–train collisions in Balule Nature Reserve
Ingwe Leopard Research	Study of Leopard movements in the greater Hoedspruit region.
SAEON	Riparian trees survey
Sensing Clues	Daily automated security reports, predictive mapping of Black Rhino

2. Conferences

In August WITS University and K2C biosphere reserve organised a Science for society symposium. This often-overlooked aspect of science and research focusses on giving knowledge and information back to the stakeholders and the general public to help them understand what is happening to their surroundings. Paul presented on the secondary objectives of our community development projects, the Black Mambas and the Bush Babies. We often focus on the direct, or primary objectives but the secondary objectives have the potential to have an even greater impact long-term by educating and instigating behavioural change in local communities.

The South African Wildlife Managers Association (SAWMA) hold an annual conference each year in September and the research team joined again. Elwenn presented her MSc thesis on the impact of apex predators on meso carnivores. These conferences are always an excellent opportunity to learn more about current research in the sub-continent and to network with potential interns and universities.

3. Publications

In 2023, the research department contributed to the publication of 3 papers in peer-reviewed journals:

- **Bhardwaj, M., Allin, P., Collinson, W., Thela, S., Swanepoel, L.** (2023). Mortality on the Tracks: Spatiotemporal patterns to rail-kill in the Balule Nature Reserve, South Africa. *Wildlife Biology, pre-print*
- **Gordon, C. E., Greve, M., Henley, M., Bedetti, A., Allin, P., & Svenning, J. C.** (2023). Elephant rewilding affects landscape openness and fauna habitat across a 92-year period. *Ecological Applications*, e2810.
- **Wright M.G., Gatti I., Au M.G., Salehi J., Spencer C.R., Allin P., Mafra-Neto A.** (2023). Evaluating Formic Acid as a Behavioral Modifier in African Savanna Elephants. *Diversity*. 15(10):1079.

4. Media, events, and media coverage

The year 2023 had marked a truly significant date for Transfrontier Africa NPC. We had celebrated 10 years of The Black Mambas APU as an officially formed, registered and recognized all-women anti-poaching unit in South Africa and the world. It has been a long journey for all of us: from 6 women recruits in 2013 to 42 Black Mamba team members, including women rangers, response team, educators, management and maintenance, with some changes and losses in between.

From ranger recruits, The Black Mambas have grown into Sergeants, Corporals, 4x4 Drivers, Media Liaisons, PT Instructors, Pangolin Guardians, and acquired many other skills in nature conservation and related areas such as sustainable vegetable gardens and bee keeping. Some of them have gone further in their education and completed courses in teaching, ranger leadership, and FGASA Level 1 guiding. All these has been possible thanks to all our donors and partners. Our aim is to uplift our women rangers further, giving them an opportunity to grow within wildlife conservation arena.

Only 11% of a global ranger force are women. To celebrate a decade of our work in anti-poaching and illegal wildlife trade this year, we have planned a number of events and media work that are going to highlight our anniversary and address the importance of involving women into protecting the natural resources in Africa and the world.

In 2023 we had had 67 events and media interactions (including campaigns and presentations), 59 media releases, 3 conferences, 8 life skills workshops and training sessions.

In the first half of 2023 we continued empowering The Black Mambas, introducing new training workshops to enrich the scope of their knowledge and skills. We continued with health and safety workshops in collaboration with Tshemba Foundation and covered such topics as Malaria, Diabetes, Women's Health, First aid for burns, choking, overheating, dehydration, CPR. The Mambas also received an intense refresher in Ranger Advanced Medical Training with Wild Response, sponsored by The Council of Contributors and certified by Stop the Bleed (USA). Transfrontier Africa staff without exception, undertook Stop the Bleed training with Wild Response as well. In 2023 we also introduced Financial Literacy workshop designed, presented and sponsored by Kruger to Canyon Biosphere Region. In May The Black Mambas also undertook an intense training in Social Media and Camera Etiquette with Field Guides Association of Southern Africa. These skills form new ranger skillset and are critical to

work with funders and sponsors when filming and photographing updates from the field for Social Media channels. This workshop is also important in terms of personal and professional safety in the internet which, we believe, should be part of ranger training modules globally.

In February and March 2023, we welcomed our long-standing partners and members of The Black Mamba Alliance, Aalborg Zoo, and its representatives Sofie Nuzhorn and Paw Gosmer (Figure 1). Together with Aalborg Zoo African Wildlife Support they have been generously sponsoring food rations for The Black Mambas and covering some operational costs for The Mambas and The Bush Babies for the last decade. During their visit Sofie and Paw donated rations to the Mambas and brought certificates of donations from Tina Trolleys, LovElephants and [Kunst Mod Krybskytter](#).



Figure 1. The visit of Aalborg Zoo and donations of rations. Photo credit: TA

In June Leitah Mkhabela was invited to the private screening of the Rhino Man movie in London, where she was introduced to Prince William and Dutchess of Edinburgh (Figure 2).



Figure 2. Leitah meeting Prince William. Photo credit: The Royal Foundation

On the 1st of July Paul Edkins from the UK started his cycling journey from his home to South Africa. The trip is a fundraising campaign in support of The Black Mambas APU. In three months, Paul had cycled through the UK, France, Belgium, Netherlands, Germany, Serbia, Croatia. His route further will go through North and East Africa, with the final destination point in Olifants West Nature Reserve, where he will be welcomed and hosted by our teams in June 2024. You are welcome to support The Black Mambas through this campaign [here](#).

In July on the World Ranger Day we finally celebrated our 10th Anniversary and received an amazing present, a huge cake baked by a local business owner Koek en Crumels (Figure 3). We have never seen such a huge and beautiful cake! It was a blessing to celebrate the decade of safety of Rhinos and women empowerment in ranger workforce.



Figure 3. Happy Birthday, The Black Mambas! Photo credit: TA

August was highlighted by The Mambas visiting the Rietvlei Nature Reserve in Pretoria, where they shared their work and experience with SanParks Honourary Rangers for the celebration of the National Women's Day. The event was an absolute success, the Honourary Rangers requested for the Mambas to come and speak in 2024.

September month was reach in events. In the beginning of September Craig visited our partner Aalborg Zoo where he was a leading speaker at the African Wildlife Night fundraising event. Craig also presented the projects of Transfrontier Africa to the students of The Aalborg University.

On the 16th of September The Black Mambas teams took part in the annual [Wildlife Ranger Challenge](#) (Figure 4), a global fundraising event that aims to help wildlife rangers of Africa stay on duty, raise their professional profile, highlight the diversity of roles and responsibilities they have in the work place, empower future rangers to increase the numbers of wildlife guardians globally to reach 1,5 mln to be able to protect 30% of our planet's biodiversity by the year 2030. To date, we only have 286,000 rangers around the world. We believe WRC campaign can be catalytic to the increase of the number of rangers in the world.



Figure 4. The Black Mambas are getting ready to run 21 km at SAWC for Wildlife Ranger Challenge 2023. Photo credit: SAWC

One of our teams was invited to run at The Southern African Wildlife College together with rangers from SAWC, Sabi-Sands, and Game Ranger Association of Africa. Our teams are in the top 3 in sit-up challenge among women, and in the top 3 among women in 21 km half marathon race. It took us 3 hours 36 minutes to finish the race which is 23 minutes faster compared the results of the last year.

Same day, after the Challenge our Sergeant Nkateko Mzimba was awarded by [African Conservation Awards](#) as the Best Field Ranger 2023 (Figure 5). The patron of the Award is Prince Albert II of Monaco. This award is Mambas’ (and Craigs’) 11th International Award they have received for the past 10 years since their first deployment. We truly hope that the award is going to inspire other women of Africa to step into the path of wildlife conservation and find their true calling in it.

Figure 5. Nkateko Mzimba, best Filed Ranger ‘23.



In September Leitah Mkhabela joined The Rhino Man movie team, Matt Lindenberg, CEO of the Global Conservation Corps, and Orlat Ndlovu, the Head Ranger of the Timbavati Private Nature Reserve for the [Jackson Wild Summit](#) in The Grand Teton Park, USA. The Rhino Man movie has been nominated as a finalist in 2 categories in this prestigious Jackson Wild Media Award. Read more about the movie [here](#). At the Summit, Leitah represented all the women rangers out there who have gone through challenges of training, and finding her voice in a dangerous, man dominated industry.

The 3d Quarter culminated on the 30th of September with the launch of [The Global Gala for Rhinos](#) at the Royal Geographical Society, London (Figure 6). This annual event organized by our partners Helping Rhinos aims to raise awareness about critical aspects of Rhino conservation in Africa and raise significant funds to help Rhino conservation projects on the ground, The Black Mambas and The Bush Babies being among them.



Figure 6. Lewyn at the Global Gala for Rhinos.

The 3d quarter awarded us with our partners' and sponsors' visits: Luke Reavely (General Manager at the Australia Zoo), Dermot and Phoebe Kavanagh (Connected Planet Foundation) who joined the Mambas on patrols, had a calisthenics session with them and donated calisthenics equipment sponsored by Gravity Fitness; Adventures for Love ladies who came to meet the Mambas, hear the updates and donate sports bras for physical fitness sessions and other personal care products sponsored by Polyflor South Africa..

We have been in the process of establishing partnership with Intrepid Travel (UK) through Helping Rhinos and SDG Solutions. Intrepid Travel is a small tour and adventure travel company who aspires to make travel sustainable by giving back to the communities of the countries they work with. SDG Solutions (Germany) consults businesses on Sustainable Development Goals (UN) and the way businesses can operate based on these goals. In both cases The Black Mambas and The Bush Babies are going to be the beneficiaries of these partnerships.

In the 4th quarter Leitah Mkhabela attended Illegal Wildlife Trade in Southern Africa conference in SAWC and it was her first time ever to present scientific data on perceptions of poaching and animals by the locals, collected by our partners from The Living Desert Zoo and the Gardens. The conference was a huge success. We witnessed how the role and contribution of women in ranger workforce is gaining more interest and women are receiving recognition for their work as wildlife rangers.

The same month Lewyn Maefala presented The Bush Babies project to the schoolgirls who are in the process of taking the next step in life, choosing their careers. Lewyn's passion, energy and enthusiasm left no one indifferent, and her workshop was very popular among the girls.

We have been in the process of establishing partnership with Intrepid Travel (UK) through Helping Rhinos and SDG Solutions. Intrepid Travel is a small tour and adventure travel company who aspires to make travel sustainable by giving back to the communities of the countries they work with. SDG Solutions (Germany) consults businesses on Sustainable Development Goals (UN) and the way businesses can operate based on these goals. In both cases The Black Mambas and The Bush Babies are going to be the beneficiaries of these partnerships. More updates on partnerships will come in the following months.

We would like to warmly thank all our sponsors and partners for making 2023 so productive and for the decade of support. The decade of The Black Mambas All-Women APU had become possible because of you all.

Table 2. Media and events in 2023.

Date	Market	Event / Media
December		
25	Local	Pondoro Talk
22	Local	Pondoro Talk
20	Local	Christmas Parade
13-14	Canada	World Most Dangerous Roads filming
1-10	USA	Kelly Krull. Storybook about The Mambas
November		
25	USA	Pondoro Talk
22	Brazil	Pondoro Talk
21	Local	Ketha 2024 Story Project launch
7	Global	Rhino Disharmony Campaign photoshoot
2	USA/Global	Scientific American. Interview with Naledi
1-7	South Africa	Earth Ranger Conference
1	Netherlands/Belgium	Pondoro Talk
October		
24-26	Local	Illegal Wildlife Trade in Southern Africa. Conference at SAWC
16	UK/SA	Eco-Training. Filming
12-13	Global	Ford
12	South Africa	Girl Child Dialogues
5-7	UK/Global	BBC
4	Local	Pondoro Presentation
September		
30	Global	The Global Gala for Rhinos (The Royal Geographical Society, London)
27	USA	Pondoro Presentation
25	Global	Jackson Wild Summit, Tenton National Park, USA (Leitah Mkhabela)
24	Local	National Heritage Day at the Bush Babies Centre
23	Netherlands/Belgium	Pondoro Presentation
22	Local	World Rhino Day Grand Parade
18	South Africa	Adventures for Love, donations of sports bras

Date	Market	Event / Media
17	Germany	One Ride 2023. Motorcycle riding campaign in support of the Black Mambas
16	Africa	Wildlife Ranger Challenge
16	Africa	African Conservation Awards ceremony at Southern African Wildlife College (Nkateko Mzimba)
14	NA	Pondoro Presentation
13	USA	Pondoro Presentation
1-5	Aalborg, Denmark	African Wildlife Night at Aalborg Zoo, Denmark, lectures at the University of Aalborg (networking and fundraising)
August		
31	Local	Health Talk with Tshemba Foundation. HIV/AIDS
30	Italy/Germany	Pondoro Presentation
18-19	South Africa	Africam filming for Samsung
18	USA	Mamba Presentation for Michigan State University
17-19	UK	Connected Planet Foundation visit + donation of calistenics equipment
19	South Africa	Cape Talk LIVE
9	South Africa	Womens Day with SanParks Honourary rangers in Rietvlei Nature Reserve, Pretoria.
7	Australia	ABC LIVE interview
5	Canada	Pondoro Presentation
3	Local	10 Year Anniversary Parade
July		
31	Local	World Ranger Day: Talk on Hoedspruit FM
27	USA	Meet and greet with Beardsley Zoo
24	AU/USA/EU	Vet Student Talk via Loop Abroad
23	AU/USA/EU	Vet Student Talk via Loop Abroad
11-12	UK	Joe Walsh, iNews
12	Australia	Pondoro Presentation for Luke Reavely, Australia Zoo
1	UK/Global	Paul Edkins. Bike cycling fundraising campaign from the UK to The Black Mambas HQ
June		
23-29	Global	World Female Ranger Week
15	Local	Protest against bail for rhino poaching kingpin Big Joe
14	UK	Rhino Man movie private screening, meeting with Prince William and Dutches of Edinburgh
12	UK	Leitah and How Many Elephants at Pulpo Negro
May		
31	Global	Screen Share Africa
26	USA	Pondoro Presentation

Date	Market	Event / Media
24	Turkey	Pondoro Presentation
21	Global	Global Biodiversity Festival
April		
28	Local	R.A.M.P. Training for the Black Mamba with Wild Response
26	NA	Pondoro Presentation
20	Turkey	TRT World Just 2 Degrees
10	NA	Pondoro Presentation
March		
31	Local	Stop the Bleed training for Transfrontier Africa with Wild Response
28	Local	R.A.M.P. Training for the Black Mamba with Wild Response
27/28	Canada	Bruno's Holidays TV show filming
21	UK	NatGeo Traveller Zoom interview
20-25	USA	Jonathan Franklin
NA	Sweden	Magnus Nystrom
13	Global	United for Wildlife Conference at Timbavati Private Nature Reserve
13	Local	Financial Literacy Training 3, 4 and 5 for The Mambas with Kruger2Canyon Biosphere Region
12	Local	Health Talk for the Mambas with Tshemba Foundation: First Aid
8	Germany	Pondoro Presentation
7	Global	The Rising Lioness Podcast
7	Germany	ARD German Radio filming and interviews
6	Global	Carbon Brief Zoom interview
February		
18	Local	World Pangolin Day (Presentation and documentary)
14	Local	Health Talk for the Mambas with Tshemba Foundation: Womens Health and Malaria
13	Ivory Coast	Financial Literacy Training 1 and 2 for The Mambas with Kruger 2 Canyon Biosphere Region
12-26	Africa	Africa Foto Fair: exhibition of the portraits of two Mambas
8	South Africa/Denmark	Aalborg Zoo partners visit
January		
14	UK/Russia	Pondoro Presentation

Table 3. Media coverage for 2023.

Date	Media	Market	MUU	Link
December				
29	Rhino Disharmony	NA	-	http://tinyurl.com/2p6vmj6b
18	ABC RN	NA	-	http://tinyurl.com/38v3d3vy
November				
30	Eco-Training	South Africa/Global	-	http://tinyurl.com/4hke8srv
27	Daily Sun	UK/Global	-	http://tinyurl.com/44ap45ke
20	Happy Scribe	UK/Global	-	http://tinyurl.com/3t7pwr6
16	BBC	UK/Global	-	http://tinyurl.com/24yzbhz9
October				
31	Global Conservation Corps	USA/Global	-	http://tinyurl.com/3w66t9ad
30	Good Things Guy	South Africa	-	http://tinyurl.com/4kjd23ne
18	Africam	South Africa/Global	-	http://tinyurl.com/y9y9tvuc
13	Samsung Newsroom	South Africa/Global	-	http://tinyurl.com/4j3329f3
13	Kruger 2 Canyon	South Africa	-	http://tinyurl.com/28jdn7su
10	United for Wildlife	UK/Global	-	http://tinyurl.com/5bx4r4vt
5	Samsung Mobile	Global	-	http://tinyurl.com/38emxkjb
September				
23	Letaba Herald	South Africa	-	https://shorturl.at/ivxZ3
21	Letaba Herald	South Africa	-	https://shorturl.at/fCJVZ
20	Getaway Magazine	South Africa	-	https://shorturl.at/dTU13
18	Good Things Guy	South Africa	-	https://shorturl.at/jF147
17	African Business	Africa	-	NA
17	African Business	Africa	-	https://shorturl.at/huzBX
August				
28	Africam	South Africa	-	https://rb.gy/um9e4
19	Cape Talk Radio	South Africa	-	https://rb.gy/k1pgx
19	702	Europe	-	https://shorturl.at/cmtO3
12	Intrepid Travel	UK/Global	-	https://rb.gy/lmkdj
9	iKnews	UK	-	https://shorturl.at/uzCE4
8	ABC	Australia	-	https://shorturl.at/axyJ1
8	Podchaser	Australia	-	https://shorturl.at/zVWY7
3	Mirror	UK	-	https://shorturl.at/birFW
1	Kruger 2 Canyon News	Greater Kruger	-	https://rb.gy/aj0ys
1	Good Things Guy	South Africa	-	https://shorturl.at/msEF1
July				
31	Hoedspruit FM	Greater Kruger	-	LIVE
29	National Geographic Travel	UK/Global	-	https://rb.gy/35lfp
28	Kruger 2 Canyon	Greater Kruger	-	PDF2
June				

Date	Media	Market	MUU	Link
30	Medium (By Tusk)	Global	-	https://shorturl.at/flsZ4
29	Bloomberg	Global	-	https://shorturl.at/IOUVW
22	The Ethicalist	Global	-	https://shorturl.at/jlY26
NA	Spiked	Global	-	https://shorturl.at/DFQZ6
NA	Wilderkids podcast	Global	-	https://shorturl.at/bDW23
18	Wikipedia: Black Mamba APU	Global	-	https://shorturl.at/fizL9
May				
31	Screen Share Africa	Global	-	https://shorturl.at/hjBD3
21	Global Biodiversity Festival	Global	-	https://shorturl.at/bilLS
5	Wikipedia	Global	-	https://shorturl.at/fpzGX
April				
20	TRT World Just 2 Degrees	Turkey	-	
8	Mail and Guardian	South Africa	-	https://shorturl.at/uFHX9
March				
31	Weltspiegel	Germany	-	https://bit.ly/3Gp1b7c
27	The Rising Lioness Podcast	Global	-	http://bit.ly/3nYAobl
20	Podcast.de	Germany	-	http://bit.ly/40MQ7Jp
20	IVOX	Germany	-	http://bit.ly/3KgN9Wh
20	Oregon Public Broadcasting	Global	--	https://shorturl.at/qvzQ1
19	Deutschlandfunk Kultur	Germany	-	https://bit.ly/3zEF8ph
19	Castbox	Germany	-	http://bit.ly/40GDqzD
16	ARD	Germany	-	https://bit.ly/3Kldtu7
6	Carbon Brief	Global	-	http://tinyurl.com/4pjxy2cu
February				
19	Daily Maverick	South Africa	-	https://africafotofair.com/
19	Daily Maverick	South Africa	-	http://tinyurl.com/2zsz8mhu
12	Africa Foto Fair	Ivory Coast/Africa	-	http://tinyurl.com/5npp7asp
January				
5	Adventure	Global	-	http://tinyurl.com/3n54v7sc
3	Londolozi Blog	South Africa	-	http://tinyurl.com/mrxcnizm
NA	Rhino Man Podcast Ep 31	Global	-	http://bit.ly/3mdDms3

PART G – FINANCIAL OVERVIEW

1. Bookings

Volunteers and interns play an important role in obtaining Transfrontier Africa's objectives: the security of wildlife, research and monitoring and landscape management (which includes alien plant management). Nonwane Research Facility provides accommodation to MSc and Ph.D. interns, and the Ndlovu Bush Camp provides for Bachelor interns, volunteers and student groups to assist in all of the above, to give a holistic experience to people wishing to pursue a career in conservation management or gain experience and involve themselves in all aspects of managing a Big 5 protected area.

Most of our volunteers book with us directly, having found us online, some of them after having followed us on various social media platforms for some time. Other volunteers find us via one of our booking agents, or they book with us after having heard about Transfrontier Africa via a friend or family member. A number of schools and universities also refer their students to TA to do their internships. The table below presents an overview of the bookings made in 2023, both in Ndlovu bush camp and in Nonwane Research centre:

Table 1. Overview of paying individuals at Ndlovu and Nonwane between January and December 2023 (TA reopened on 9 January and closed on 20 December 2023).

MONTH	Nb. of individuals	Bed nights ¹	Occupancy ^{2,4} (%)	Nett income in ZAR ³
Ndlovu Bush Camp				
Volunteers	48	1 085	53 %	519 554
Interns	8	770	in above	314 030
Total	56	1 855	53 %	833 584
Nonwane				
Researchers	12	553	54,55 %	105 020
Total	12	553	54,55 %	105 020
TOTAL	68	2 408	53,78 %	938 604

¹ The number of bed nights corresponds to the number of beds occupied by volunteers x the number of nights these beds were occupied. ² The occupancy is calculated by dividing the number of bed nights by the number of available bed nights (number of beds x number of days in the month). ³ Nett income includes: bed nights at either Ndlovu or Nonwane (cost unknown and therefore not deducted), Eastgate/town transfers carried out by TA (cost unknown and therefore not deducted), and third-party services: shuttle between JNB-HDS and BNB in JNB (for both the costs are known and have been deducted). ⁴ The average occupancy per month is calculated by adding the percentages of each month divided by 12 months.

2. Sales & marketing

Transfrontier Africa launched its merchandise range in 2020, during the COVID pandemic. The range started with 200 Relate bracelets and, over the course of 2,5 years, has expanded to branded clothing and accessories (with The Bush Babies, The Black Mambas, and Transfrontier Africa logos) and to a variety of relevant items to support the sales. The merchandise range serves various purposes, such as creating awareness for our causes, generating an additional source of income, and supplying staff members and those campaigning for our causes with relevant branded clothing items, mainly T-shirts. The merchandise is being sold at a variety of locations; our very own TA Shop in Olifants West office, shops, lodges, and a supermarket.

In 2023, the items with the most profit sold at the TA Shop at Olifants West office and the monthly markets were as follows (Table 2):

1. TA T-shirts – R6 705,82 (this includes the sale of 110 khaki TA T-shirts to volunteers and interns who need them for field work)
2. Relate Bracelets – R4 048
3. BM Hoodies – R2 212,50
4. BM T-shirts – R1 836
5. TA Bush Jackets – R1 600,20

Over the past year we've introduced 4 new products (BM Hoodies, Stickers with TA, BM, and BB logo), necklaces with a stone hanger, and airplant and baobab pod ornaments. All of them nice additions to the existing range. In the skin care range, we've noticed an increase in sales in the soap bars (they make such a nice and affordable gift), and stickers are starting to sell nicely as well. We've noticed that the necklaces and the display with the skincare range and ornaments attract additional traffic to our market stall. We've attended 10 out of 12 monthly markets, with the July, August, and December markets being the top 3 in sales, and we're offering a card facility since August (Figure 1). Other than selling merchandise, the market proves to be a great place to spread awareness about our causes to both local as well as overseas visitors, with Hoedspruit being a popular tourist destination for wildlife enthusiasts and those en route to Kruger National Park.



Figure 1. Debra and Rethabile, Black Mambas, posing with TA staff, interns, volunteers and researchers at the market stall December 2023.

Table 2. Sales per item for the TA Shop at Olifants West office and the monthly markets, from 1 January to 31 December 2023.

Items	Logo	Nett profit in ZAR	Nett profit per item in %	Total Qty sold	¹ Profit in ZAR TA Shop OWNR
Clothing					
Bush Jackets	TA	400,05	30,31%	4	1600,2
	BM	400,05	30,31%	3	1200,15
Hoodies	TA	147,5	31,55%	3	442,5
	BM	147,5	31,55%	15	2212,5
T-shirts	TA	55,42	28,98%	121	6705,82
	BM	54	26,47%	34	1836
	BB	59	28,92%	5	295
T-shirts Ladies	TA	49	24,02%	2	98
T- shirts camo	xx	57,5	35,60%	3	172,5
Caps	TA	31	22,10%	6	186
	BM	31	22,10%	24	744
	BB	31	22,10%	6	186
Beanies	TA	18	17,65%	5	90
	BM	18	17,65%	5	90
Bufs	TA	37	36,27%	4	148
	BM	37	36,27%	4	148
	BB	33	32,35%	1	33
Total clothing				245	16187,67

Items	Logo	Nett profit in ZAR	Nett profit per item in %	Total Qty sold	¹ Profit in ZAR TA Shop OWNER
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Accessories					
Relate Bracelets	xx	16	31,37%	253	4048
Elephant Bracelets ²	xx	102	100,00%	10	1020
Stone Necklaces	xx	38,25	25,00%	20	765
Water bottles	TA	22,5	10,59%	1	22,5
	BM	22,5	10,59%	4	90
	BB	22,5	10,59%	1	22,5
Flasks	TA	62	22,10%	2	124
	BM	62	22,10%	2	124
	BB	62	22,10%	1	62
Mosquito nets	xx	27,5	9,24%	19	522,5
Airplants	xx	42,5	25,00%	7	297,5
Stickers	TA	12,76	75,06%	4	51,04
	BM	12,76	75,06%	18	229,68
	BB	12,76	75,06%	2	25,52
Total accessories				344	7404,24

Skin Care Range					
Soap bars	xx	17,75	37,97%	27	479,25
Liquid soap 50ml	xx	17	50,00%	1	17
Liquid soap 200ml	xx	40,37	49,99%	5	201,85
Hand cream 50ml	xx	17	50,00%	10	170
Hand cream 200ml	xx	70,12	50,00%	5	350,6
Bath Salts	xx	27,625	50,00%	1	27,625
Total Skin Care Range				49	1246,325

Library					
Plea/Elephant	xx	118,5	48,07%	1	118,5
Crash/Rhino	xx	8,25	3,59%	0	0
Total Library				1	118,5

Total				639	24956,74
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¹Profit is calculated as [retail price – (VAT 15 % + production cost)] x number of items sold. ²The Elephant bracelets have been donated, there are no costs.

ACKNOWLEDGEMENTS

Transfrontier Africa would like to thank all the sponsors, donors and fundraising partners listed below who support our different programs, and Transfrontier Africa team who work hard every day to meet the objectives fixed by the organisation and OWNER.

- Australia Zoo
- Aalborg Zoo
- AZAWS
- Africa Tours
- Afreco Tours
- Africam
- Anna Rosholt Jewellery Design
- Cleve Hicks
- Connected Planet
- Department of Environment, Forestry and Fisheries
- Der Touristik Foundation*Endangered Wildlife Trust
- Elephants Alive
- Empowering Success
- Game Ranger Association of Africa
- Global March for Elephants and Rhinos
- Helping Rhinos
- Flying4Rhinos&Conservation
- Hi-Tec South Africa
- How Many Elephants
- JuliusK9
- Kansas City Zoo
- Kruger2Canyon Biosphere
- Ker&Downey
- LUSH Charity Pot
- Landowners and Lodges of OWNER
- Linda Crawford
- My Planet
- My Green World
- Maidknew
- Odyssey Teams
- Olifants West Nature Reserve
- Pedalling Against Poaching
- The Perfect World Foundation
- Pennies4Eles
- PJ Kombucha
- PJ Nisbet&Associates
- Platter Project
- Point Foundation
- Pohl Foundation
- Pondoro Game Lodge
- Raymund Kunn
- Rettet Das Nashorn
- Rhino Mercy
- Rocking4Rhinos
- Ray and Margie Dearlove and Family
- Sarafin Art
- SANParks
- Sensing Clues
- Stichting Wildlife
- Samsung
- Soldiers for Wildlife
- 2XL Swagger Brands
- The Living Desert Zoo & Gardens
- Taronga Zoo
- Thoiry Zoo
- Tusk
- Tourvest
- TECHNE
- UNEP
- Undaunted Apparel
- The Wagenmann Family Trust
- Wilhelma Zoological & Botanical Garden
- Wildlife Warriors
- Wild Response
- Anonymous Sponsors

CONTRIBUTORS

Transfrontier Africa would like to thank all the contributors to the report listed below who extracted and analysed the data for the different parts, and Transfrontier Africa team who work hard every day to meet the objectives fixed by the organisation and OWNR.

- **Andrew Verzmoter** – *Security & Black Mambas*
- **Glen Tompson** – *Security & Black Mambas* (pangolin data)
- **Lewyn Maefala** – *Bush Babies*
- **Kelly Rafferty** – *Ndlovu Bush Camp*
- **Elwenn Le Magoarou** – *Ecological Monitoring* & report compilation
- **Paul Allin** – *Research Projects & Networking and Partnerships* (subparts 1 to 3)
- **Valeria van der Westhuizen** – *Networking and Partnerships* (subpart 4) & report publication
- **Linda Holliday** – *Financial overview*
- **Craig Spencer** – Report supervision and proofreading

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