Conservation Management Plan

Botswana

CONTENTS

1. EXECUTIVE SUMMARY

Projects Abroad and partners Kwa Tuli private wildlife reserve are now entering their second year in the Tuli Block, Botswana where we have undertaken an unprecedented conservation project. The project aims to achieve a legally binding conservancy for the central Tuli area. This will be achieved through using various ecological research techniques to prove that this area of Botswana is unique, wild and an essential area for protecting biodiversity in Southern Africa.

To date there has been very little research conducted in the area. Projects Abroad and Kwa Tuli hope to act as a leading authority for the area in conservation and issues relating to biodiversity. And through our research we hope to show how unique and diverse the area is for both flora and fauna.

Our primary research is an elephant (*loxodonta Africana*) study as it is the species most associated with the Tuli Block as fences have confined the species and blocked natural migration routes. Therefore research is required into their ecology so rash decisions cannot be made on their numbers and movements. Other studies either take the form of scientific research of practical measures aimed at improving best practice techniques when upholding a reserve and preserving and enhancing biodiversity.

In recent years there have been increased flooding events in the Limpopo River bordering South Africa, this project aims to document these events and their effect on the habitat and its biodiversity. With lions not utilising the area we aim to record their movements and offer support to local cattle owners in protecting their herds and reducing any conflict that could result in the lions being hunted or poisoned.

2. BACKGROUND INFORMATION

The Republic of Botswana is located in Southern Africa bordering South Africa to the south, Zimbabwe to the east, Namibia to the west and Zambia to the north. A stable civilian government since winning independence form the British in 1966 has allowed for the economy to grow and stabilize mining and tourism industries. Conservation legislation and laws have allowed for the eco-tourism sector to grow as Botswana has allocated vast areas of land to protected areas and conservancies.

Botswana has a relatively small population of 2, 098,018 (2012) of which 61 % live in urban areas. The capital city of Gaborone is the major economic centre with a population of 196,000, making it small when compared to other capital cities in the African continent. The country's diverse landscape comprises a total size of 581, 730 sq. km of which 15 000 sq. km is made up of water bodies. The population density is highest in the east of the country due to the Kalahari Desert and the Okavango Delta both situated in the central, west and northern areas.

The Kalahari Desert covers 900 000 sq. kilometres stretching into parts of Namibia and South Africa. It is a semi-arid desert with some parts made up of sand and some savannah plains. Some areas can be grazed after periods of high rainfall although in general it contains more biodiversity than a true desert

The Okavango Delta is the largest inland delta in the world made up mostly of swamp land totalling 15 000 sq. kilometres. It is home to one of Africa's greatest wildlife concentrations due to the much needed wetlands in an otherwise dry region. The diversity of mammals, birds and reptiles in this area make it truly unique and one of the earth's biodiversity hotspots.

2.2 Geography

Botswana is a landlocked country which is mainly flat with its lowest point found at the junction of the Limpopo and Shashe rivers at 513 m above sea level, and its highest point found in the Tsodilo Hills at 1489 meters.

It is considered a semi-arid country and with seasonal winds from the west carrying sand and dust across the country. These factors along with overgrazing make the country especially prone to desertification where large areas of land become empty spaces with only the most resilient flora and fauna being able to exist. This desertification is mainly in the west of the country where the Kalahari is located but can also be found in areas that experience low annual rainfall.

Soils in Botswana are generally made up of thick sand layers although in the western side of the country they are more fertile due to the milder climatic conditions. Much of the country is covered by sandy soils. The eastern areas have hills and drainage depressions which feed the Limpopo River. These soils are mainly sandy loams to sandy clay loams, with shallow skeletal soils where heavy, sporadic rainfall washes newly formed soil materials into low lying areas and down drainage lines. The soils are thus mainly alluvial and /or colluvial.

The geomorphology of Botswana is divided into the Okavango Delta, the Sandveld and the Hardveld hypsographic regions. About two thirds of Botswana falls under the Sandveld or Kgalagadi desert. These regions receive the least amount of rainfall compared to the rest of the country.

Botswana digs wells in the ground to get water beneath the earth's surface for drinking and other purposes. These have been in existence for a long time in Tswana culture. Groundwater in Botswana as in all other places around the world occurs in geologic formation known as aquifers, which may be defined as a formation that may either be a consolidated rock or unconsolidated pile of sediments, that contain sufficient saturated permeable material to yield significant quantities of water wells and springs.

2.3 Climate

The hot summers in Botswana are from November through to February where the increase in temperature causes storm clouds to form and the much awaited annual rains to fall. From May to August, temperatures drop especially during the night with very little and in most cases no precipitation experienced. It is during these dry cold winters that much of the wildlife suffers the most from lack of water and food as the bush dries up and plants cannot produce any foliage.

Projects Abroad recognizes the need to build a weather station within the study area. Over time this data will provide essential information when assessing bird presence and migratory patterns. It will also allow conclusions to be drawn on the availability of different fruits and flowers of many plants that local wildlife populations depend on.

2.4 Study Area

The Tuli Block is located where the Shashe and Limpopo rivers meet. It comprises a narrow strip of land with Zimbabwe to its east and South Africa to the south. The area is made up of 12 000 hectares of privately owned strips of land. It is relatively open with no fences although there are pockets of land with fences for agriculture. This lack of fences and the areas unique landscape of large granite and basalt hills ('koppies'), thick belts of Mopani *(Colophospermum mopane*) and riverine woodlands all

contribute to a rough and generally inaccessible environment to conduct any form of research. Wildlife populations have generally thrived in the area with significant populations of vulnerable and endangered species such as elephant (*loxodonta Africana*), African wild dog (*Lycaon pictus),* lion (*panther leo*), cheetah (*acinonyx jubatus),*and ground hornbill (*bucorvus leadbeateri)* to name a few.

2.5 Social Context

Botswana has transformed itself from a least developed country when it won its independence in 1966 to a middle income country in 2012. This is mainly due to a stable government and judicious management of diamond mines. It was the discovery of diamonds that increased their per capita income from USD 70 in 1966 to USD 6500 in 2012.

Despite this impressive economic record in comparison to other African countries, Botswana is still faced with high levels of poverty, inequality and unemployment. It has a high HIV/AIDS rate with the World Bank reporting that Botswana has the second worst HIV epidemic in the world undermining its socioeconomic achievements since 1966. It is estimated that at least one quarter of the population is affected by HIV/AIDS.

Botswana also faces challenges in poverty and inequality issues with records contradicting its economic history. One third of the country lives below the poverty line mainly due to a large unemployment rate of 20%. It was thought that with the discovery of diamonds jobs would be created in the mining industry although actual figures show that approximately 5% of the national labour force is employed in this industry. Inequality issues have somewhat been resolved through Botswana ratifying international agreements relating to gender equality. The Abolition of Martial Power Act (2004) was seen as one of the most powerful pieces of legislation in Botswana as it gave women equal rights to men in marriage, property holding and guardianship of minor children.

The Botswana government has recognised that utilization of its natural resources is an answer to tackling issues related to economic development. They have dedicated over 34% of the land to national parks, game reserves and wildlife management areas. As 77% of the country is made of the Kalahari Desert this is quite a significant amount of land dedicated to the preservation of wildlife as areas such as the Okavango hold such a high ecological importance. It is through this dedication to growing the economy through eco-tourism and Botswana's close proximity to South Africa that has allowed much of the land to remain protected and benefit both local communities and wildlife.

3. MAJOR THREATS TO THE AREA

- Livestock agriculture has consistently been a threat to Botswana and the Tuli block for many generations. As it is instilled within the culture of the people to own livestock, the nomadic grazing of goats and cattle has decimated green areas. Livestock small holders and the agro industry also represent major threats as cattle are often free to roam and graze in areas outside the ownership of their owners. This has allowed farms to own more livestock that their land is capable of carrying, resulting in the direct competition between wildlife and livestock for areas to graze and browse.

- Mining, quarrying and the development of renewable energies have resulted in the destruction of large areas of wilderness and altering of hydro systems.

- Hunting and poaching has always represented a threat to any African eco-system with Botswana being no exception. Although the Botswana Defence Force (BDF) is quite proactive in combating

illegal hunting and there are strict sentences for offenders, there are many loop holes and laws that allow land owners to hunt or sanction a hunt. The inaccessibility of much of the land also makes it difficult for the BDF to patrol all affected areas.

- Human – wildlife conflict. With such a high number of livestock roaming free in Botswana it is inevitable that some predators will hunt these animals. It is due to poor animal husbandry in most cases although the resulting actions usually involve wild animals being killed through the poisoning of carcasses. Arable farming also has its own conflict with many animal species helping themselves to crops in times of drought, food scarcity and when farms are built in traditional animal paths. Many species fall victim to farm hands ranging from porcupine to elephant. Laws allow for farmers to shoot/kill 'problem animals', although with no regulation of these killings it is hard to assess if the measure is effective or destructive.

- Natural system modifications such as dams and fires cause huge environmental problems. Dams alter natural water systems through flooding of vast areas and changing the natural flow in rivers. The dams in Botswana are often built without extensive Environmental Impact Assessments and without any knowledge of how surrounding areas will be affected.

- According to the Global Invasive Species Database Botswana has 34 recorded species of invasive plants and animals. With the Tuli Block having very limited resources in water and fertile soils, these invasive plants/animals have the potential to out compete naturally found species and therefore need to be carefully controlled.

- Pollution caused by agricultural activities has caused significant harm to water systems as delicate eco-systems struggle to deal with toxins. Bio accumulation of these toxins to other species has meant that agricultural waste has become a major threat and one which needs to be closely monitored.

- Drought and desertification within Botswana and the Tuli Block are major threats as they have direct effects of biodiversity and can cause areas to change beyond rehabilitation and recovery.

- Lack of education and public awareness of environmental issues have allowed a culture of lack of care to form amongst local populations. Without poverty reduction and education into the importance of natural resources and biodiversity for tourism and beyond, it is difficult to see local communities taking roles in protecting land and biodiversity.

4. OVERALL AIM

The overall aim of this project is to create a legally binding conservancy within the central Tuli Block where all landowners will abide by an agreed constitution in protecting the environment.

4.1 Objectives

Projects Abroad will rely on ecological research techniques to publish and promote the area as an area of ecological importance through recognition of endangered species populations and suitable habitats.

Projects Abroad and Kwa Tuli aim to be a leading authority in the area for research and latest techniques in land management for the preservation and enhancement of biodiversity.

5. ELEPHANT RESEARCH

5.1 Aims and Objectives:

- To compile an accurate identification portfolio for the elephant population utilizing Kwa Tuli.
- To use this portfolio to identify distinct family groups (herds) identifying their size, age and sex composition.
- To identify and record patterns in movement routes across Kwa Tuli, especially direction of movement to and from waterholes.

5.2 Methodology:

Drive or walk from camp to an elephant observation location whilst utilizing opportunistic elephant sightings.

Each observation will record the following:

1. Herd age composition through noting the number of individuals within each age bracket of juveniles, immature and mature.

2. Herd sex composition through recording the number of males and females within each age bracket.

3. Cardinal direction of movement, if not interrupted by human presence is recorded in what direction elephants enter and exit observation areas.

4. GPS location

Individual elephants will be identified and the following data recorded to build up an I.D. portfolio.

5. Identifying features (tusk absence/presence/deformity, ear markings, calves).

6. Take identification photographs

Date, time and weather will also be recorded during each observation to allow comparisons to be made and further conclusions drawn.

5.3 Justification for Research:

Little information has been recorded on the ecology of the elephant population in this area. Traditionally, elephants have moved into the area from Zimbabwe and due to fencing barriers in South Africa, occur in high abundance in the Tuli area. This information will provide an accurate description of the ecology of the elephant population in the area. Elephant have an impact on ecosystems and agricultural areas, and with corresponding studies on other ecological aspects of the area, the research can be utilized to describe the impact of elephants on the Tuli ecosystem. This will pin point areas for effective elephant population management to maintain a harmony between all stakeholders in the area.

A comprehensive study of the population structure (number of individuals, and age and sex composition) of the elephant population will allow for any long term changes in this structure to be monitored and facilitate an assessment of overall population stability. There continues to be conflict between elephant and farmers in the area, due to proximity between the two. Elephant suffer

seriously from poaching and are caught in snares directed at other species. These can cause loss of or damage to appendages and ultimately affect survival. Certain age groups may be the most heavily affected by this. Elephant, as for many species, suffer heavily throughout the winter drought period. The young, who cannot effectively suckle, are the most susceptible. Both poaching and environmental pressures will alter elephant population structure and compromise stability of the population.

The study area is subject to very oppositional seasons, the wet (October to February) and dry (March to September) season. This plays a significant part in the availability of vegetation according to season. Elephant also consume large amounts of water on a daily basis. In the wet season, this is partially available in the browse. In the dry season, elephant spend a huge amount of time in the proximity of waterholes, to drink water and to cool off. A study of direction of movement of herds will aid in identifying patterns in elephant movement as well as seasonal changes in movement, which is predominantly based on availability of water and browse. This will facilitate the potential for elephant population management through waterhole management. If certain artificial waterholes are made available only at certain periods throughout the year, it may be possible to direct elephant movement routes away from agricultural areas or areas of over browsed vegetation, and into areas that at a particular time period can cope with elephant presence and utilization. This would be on a rotational basis, and would be continually mitigated and adapted in relation to the changing environment.

6. BAOBAB (*ADANSONIA DIGITATA*) SURVEY

6.1 Aims

- Investigate the spatial distribution of baobabs within the central Tuli area.
- Record the damage to trees caused by elephants to investigate spatial distribution (hotspots) of damage.
- Identify variables effecting the spatial distribution of the trees and damage.
- Investigate different theories of baobab utilisation by other naims through the use of remote sensor cameras.

6.2 Methods:

The study area is Kwa Tuli reserve and its neighbouring property Sukses. From a walk over survey of the area and previous studies it is apparent that a lot of baobab trees in this area have substantial damage caused by elephants. As the two study areas are in such close proximity they will offer areas with very similar variables that affect the ecology of baobabs.

In order to investigate the spatial distribution of the baobabs, all trees had their locations recorded using GPS handsets. A number of variables were also recorded so that potential relationships between damage and these variables can be investigated. These variables are as listed: estimated height of the lowest living branch, estimated height of the tree, % damage to the tree, girth at ground level and at 1.5m above ground level, accessibility to elephants, substrate type and living utilisation by animals.

The est. height of the lowest living branch and est. height of the tree was recorded by using a clinometer. Due to the various growth forms of the baobabs ground level for measuring height, girth at ground level and also the point to measure 1.5m for the measurement of girth at 1.5m for each tree was established by finding the lowest point at which the tree was accessible from 360°. The lowest living branch was established to be the branch growing closest to the point on the ground directly below it. Ground level for measuring the height of the lowest living branch was established as the lowest accessible point directly below the lowest living branch, as illustrated in Figure 1.

6.3 Figure 1. Showing location of measurements of trees not on flat land.

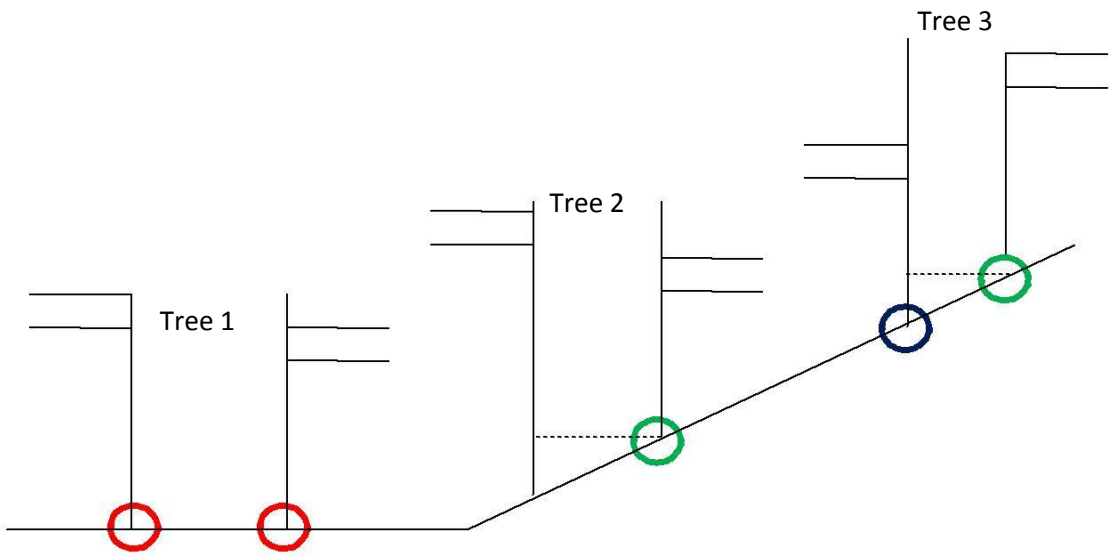
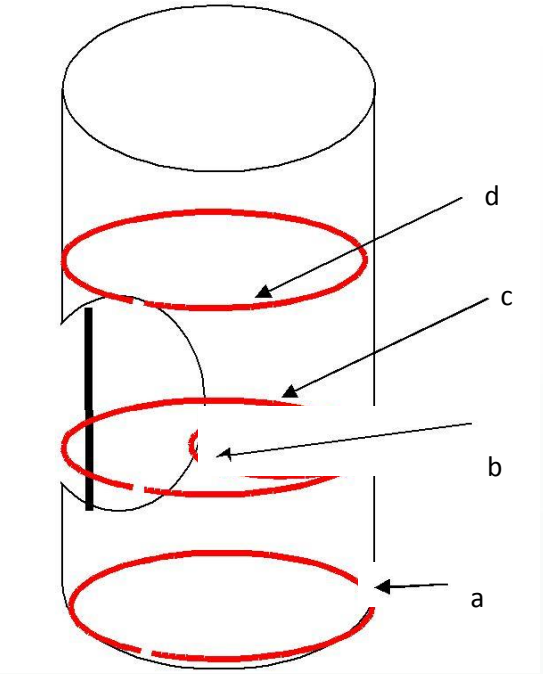


Figure 1. Tree 1 depicts a tree growing on flat ground and so any point around the tree can be used as ground level, indicated by red circles, for measuring tree height, girth at ground level and girth at 1.5m. The height of the lowest living branch can also use this point. Tree 2 depicts a tree growing on a slope. In this case ground level for measuring tree height, girth at ground level and girth at 1.5m is at the lowest point at which the tree can be measured horizontally through 360°, indicated by the green circle. The lowest living branch is also directly above this point. Tree 3 also depicts a tree growing on a slope, as in Tree 2 the lowest point that can be measured horizontally through 360° and is used for measuring tree height, girth at ground level and girth at 1.5m, however the lowest living branch is growing above the lowest extremity of the tree, indicated by the blue circle, and so this point is used as ground level for the measurement of the lowest living branch.

The damage to trees caused by elephants ranges dramatically in its extent. It can occur as a few small holes in the bark to 2 or 3 cubic metres of bark and trunk material being removed from the tree. For this reason the damage to the bark was recorded in 4 categories: light superficial, heavy superficial, light severe damage, and heavy severe damage. These were judged based on observations of different levels of damage on several baobabs. Trees in both superficial categories showed only surface bark damage, either in small (less than 10 large marks or less than 50% of the bark surface up to a height of about 4m, which is the approximate maximum height elephants can reach. Any damage higher was considered old or caused by other species such as Baboons or rock Hyraxes) or large quantities (any damage greater than the previously outlined description), respectively. Severe damage was considered to be any damage where trunk material was exposed and damaged, with light severe damage being classed as any such damage where the tree does not appear to be in imminent danger of falling. Whereas a tree was considered to be in the category of heavy severe damage when the tree had less than approximately 33% of its assumed trunk presence and considered in risk of collapse.

The girth at ground level and at a height of 1.5m was recorded using a tape measure and in cases where the tree is growing on a slope, the highest low point was the mark for ground level with 1.5m measurement taken from that point. In cases where there is substantial elephant damage at the 1.5m point both the girth at 1.5m and, where possible, the girth directly above the damage was also recorded so as not to give a warped impression of the dimensions of the tree and this fact was noted in the data collection process. In cases where there was substantial elephant damage an estimate of

the girth at 1.5m was measured by placing a solid object at the extremity of the damage and using that as a brace the measurement could be taken, in order to give an indication of the dimensions of the tree if it had not sustained damage, see figure 2.



6.4 Figure 2. Depiction of a tree showing the four possible measurements taken on an substantially damaged tree: (a) girth at ground level, (b) actual girth at 1.5m, (c) estimated girth at 1.5m, (d) girth above damage.

Accessibility to elephants was recorded by placing the trees into 3 groups: easily accessible, moderately inaccessible and difficult to access. These groupings are determined by a combination of factors including gradient of slopes to the baobabs, proximity of large boulder and looseness of substrates in the surrounding areas. For example a tree growing in the open with no obstructions is regarded as easily accessible whereas a tree growing between large boulders or on top of a steep hill is regarded as difficult to access. The substrates on which the baobabs are growing were also recorded by the use of 4 groups. These are: rock, soil, sand and shale. It is assumed that all trees started growing in soil but the substrate relates to the main surface type visible protruding from beneath the tree. Living utilisation by animals was recorded by observing nests that have been built, both occupied and unoccupied, and looking for evidence of mammal, bird and reptile species occupying the tree for either permanent habitation or as regular roosting sites. Where possible these species were identified and any unidentified markings, nests or burrows were investigated further with the use of camera traps to attempt to identify with certainty the makers, or users of these features.

In 2014 remote sensor cameras will be used to study how the trees are being utilised both night and day. Trees will be chosen depending on their locations and immediate surroundings and camera traps will be set in the canopy and on the ground in an attempt to cover all angles and all animals that may utilise the tree. It is hoped that these video images will provide the team with new knowledge on how the trees are being utilised whether it is from a single species such as the elephant or form a wide range of species.

It is vital to keep this survey going for many years to be able to accurately depict the damage to the trees and how they are being utilised. The data sets will allow for trees that face unrepairable damage to be protected. Population trends will also be recorded so that management decision can be taken to ensure that the baobab population in the area remains a vital part of its ecology as it has done for thousands of years.

7. MAMMAL INVENTORY

7.1 Aims

The objective of compiling a mammal inventory list is to ascertain what species occur in the reserve opposed to what has been visually recorded (sightings) and documented in the form of mammal guides, distribution maps etc. Numerous species of mammals are in fact nocturnal, adding to the rarity of sightings and the knowledge of their existence. Walking, observing and recording at night in such a large wilderness area without disturbing the natural habits of mammals is a near impossible task let alone the dangers of moving around such a treacherous terrain by night. This means that weather proof and durable cameras with ample flash need to be used in order to meet the various environmental constraints whilst recording accurate information.

7.2 Method

Line transects are used to cover the optimal distance of the reserve where each camera will be positioned along a 2km transect line with an equal distance of 250m between each of the 8 camera traps. Due to the wildlife in the area, each camera will be raised 1m above the ground and facing downward so as to reduce the risk of damage from Spotted Hyenas and any other inquisitive species as well as allowing for best possible target area. Furthermore, due to previous damage by elephants on earlier camera traps, a small drop of 'chilli sauce' will be placed on top of each camera casing as it is known to be a strong deterrent as elephants have an extremely sensitive sense of smell. A system of trial and error will have to be executed as too much 'chilli sauce' may deter the elephants altogether from the target area and thus no data can be recorded. The transect line will then be checked twice weekly and all images will then be downloaded as well as inspecting each camera for any damages, low batteries or full memory cards. After a period of 2 weeks on one transect line, the cameras will then be moved 1km up and laid out in the same manner so as to cover as much of the research area as possible. Again the transect line will be left 'armed' and data recorded twice weekly. Through this series of transect lines a much broader range of habitat can be covered allowing for the best potential species variation and data collection.

8. BIRD CENSUS

8.1 Objectives:

- To compile an accurate list of all bird species, including migratory species, which are found on Kwa Tuli reserve throughout the year.
- To collect information on abundance, distribution, activity and seasonal movement patterns of a variety of bird species.
- To present this information in a database that can be utilized by ornithological societies and ornithological research groups.

8.2 Methodology:

Drive or walk from camp to a bird watching location.

Bird watching locations are selected randomly. The number of bird watching locations in each vegetation type is proportional to area across the reserve which is represented by that vegetation type. Bird census is also undertaken from each of the hides on the reserve.

Sit quietly at select location. With the aid of binoculars and bird identification books, for each bird or flock of birds observed within the allocated time period, record:

1. Time of observation
2. Species of individuals/flock
3. Number of individuals in flock
4. Activity of individuals/flock

Complete additional information on data sheet relating to weather, date and observation location. On return to camp, input all data into bird census database, under instruction and supervision of a senior staff member.

8.3 Justification for Research:

The Limpopo riverine system provides habitat to a number of unique resident and migratory bird species. Several of these feature as vulnerable or endangered on the IUCN red list. Their presence on the reserve and in the area, as well as their intra-specific relationships, is of high conservational importance.

The presence of diverse bird species populations on the reserve provides an important role in ecosystems. They facilitate tree seed dispersal, provide shelters for other species, control insect and parasite populations and prevent the spread of disease. It is essential to monitor these as the environment is constantly under pressure of change, which may affect bird populations.

As there are a number of areas within close proximity to the Tuli Block that have been dammed for hydroelectricity, Projects Abroad has decided to monitor these areas to investigate what bird species have been able to locate these new habitats and utilize them for feeding and breeding.

9. CROCODILE CENSUS

9.1 Justification for study:

There has never been a census to determine the size of the crocodile population along the Limpopo River in Botswana. The crocodile is a protected species in Botswana because it has been persecuted as source of meat, skins and as a threat to livestock. It acts as a good indicator of a healthy river system. If there are crocodiles in a region then it is likely there are many other species of water dwelling animals. As the Limpopo has recorded floods in the last three years it is important to gather data and determine the impact of these events of the riverine biodiversity reiterating the need to study crocodile numbers.

It is important to recognise the sheer numbers of crocodiles that escaped a farm in South Africa close to the Limpopo in 2013 with some reports suggesting a possible 15,000 individuals may have escaped. As this will have inevitable effects on the wild population and prey species, we hope to record and predict any worrying trends before the cause detrimental effects on the riverine eco-system.

9.2 Aims:

- To start recording the crocodile population at Kwa Tuli and eventually spread out along the river to censor the whole Tuli Block.
- To investigate whether the population fluctuates with seasons, and what the impacts of various weather systems, such as droughts, have on the species.
- Projects Abroad wants to be able to protect the crocodile along the Limpopo River. When sufficient data is recorded and stock piled it then can be used when contesting new developments along the riverine.

9.3 Methods:

We will walk along the Limpopo River and record the presence of any crocodile that is sighted. We also record several different parameters. These are: date, weather, water temperature, size of the crocodile, behaviour and recording its location using a GPS handset. The date and weather are noted so that we can monitor changes in individual's presence and their behaviours seasonally in different weather conditions. As for the recording of water temperature because water temperature would usually change much more slowly than air temperature it can be used as an indicator of longer term changes in weather. The water temperature is recorded by casting a thermometer into the river and waiting several minutes to allow the thermometer to adjust. The size of crocodiles varies greatly but males grow much quicker and larger than females. By estimating the size of crocodiles we can begin to estimate the sex ratio of the population. Behaviour is recorded so that we can see whether weather conditions, water temperature or size effects what they are doing.

10. SPOOR I.D.

10.1 Aims:

The aims of this project are threefold. Firstly it is used as an exercise to teach volunteers how to identify different animal spoor (tracks) and other useful tracking techniques such as ageing the spoor. We record the presence of all carnivore spoors so that we can start to develop an idea of the presence and distribution of certain carnivore species. Finally it will help contribute to the compilation of a complete mammal inventory by noting species not picked up in the mammal inventory.

10.2 Methods:

All carnivore spoors that are recognised are noted and locations recorded using GPS handsets. Species are also recorded along with length and width measurements of the track.

11. VEGETATION MAPPING

11.1 Justification for research

The Kwa Tuli property covers approximately 5000 hectares encompassing a number of vegetation types ranging from riverine woodland to sparse rocky hills (koppies). There has never been a census of the vegetation on the property and therefore, there is no certainty in regards to the proportions of vegetation types, land cover and which species are present and in what quantities. The main objective for this project is to create a comprehensive species list of the trees, shrubs and grasses present at Kwa Tuli. We also aim to ascertain the distribution of these species across the property on a seasonal basis in order to see how much land is capable of supporting vegetation and if there are any changes overtime which may indicate degradation on the land.

It is important to understand and recognise the different vegetation types and species present because it directly affects what animal life can be supported, from the smallest insects to elephants. For example, some plant species are highly toxic or have little or no nutrient value to animals whereas others play key roles in the life cycles of some species. It is therefore essential to know in what proportions these species are present and to monitor any changes in these proportions.

11.2 Aims:

- To create a comprehensive species list of all tree, shrub, and grass species on the property. To discover the distribution and relative abundance of those species.
- To determine what substrate types are on the property and what this means for vegetation/substrate relationships.
- To monitor changes in vegetation and substrate in order to see what impacts these may have on the land, vegetation and its animals.

11.3 Methods:

Site Selection:

- Split map of Kwa Tuli into different vegetation types.
- Census sites selected randomly within each vegetation type area proportionally according to the land area of each vegetation type. E.g. 10% of Kwa Tuli is riverine vegetation therefore 10% of sites will be in riverine vegetation

Vegetation Census:

- From start point begin walking in a direction which will keep you within the vegetation type for as long as possible, preferably as straight as possible.
- Record initial bearing so that a similar route can be repeated.
- Carry a 1m pole at waist level (approximately 1m above ground level) and record all woody (tree) species that the pole touches.
-

Continue until 100 samples have been taken.

Substrate Survey:

- Using the same site and routes as vegetation census.
- Carry a 1m pole and randomly touch the ground approximately every 2m and record the substrate type.
- Continue until 200 samples have been taken.

12. THE WATER PROJECT

12.1 Justification for work

12.1.1 Soil Erosion

The Tuli Block receives around 300mm of rain each year on average. Some years there can be in excess of 400mm and some years it can be as low as 200mm. This has a direct effect on the wildlife within the area with years of high rainfall seeing a higher survival rate of offspring among the antelope species and a higher rate of survival for young animals going through their first one or two dry seasons. Although this is natural there is no doubt that manmade occurrences such as farming have increased the effects of such climatic conditions through soil erosion and desertification.

Soil erosion and desertification means that the little rain that does fall is not absorbed into the ground naturally or allow for water holes to refill, it is simply lost to surface run-off which contributes to the never ending cycle of soil erosion as it creates streams which leave behind only bare soil and gulley's which untreated will grow with each new rain.

It is therefore very important to manage this soil erosion in a reactive and preventative manner to reverse current trends whilst allowing for biodiversity to increase.

12.1.2 Elephant herds

The reason elephants are a migratory species is because they need to travel vast areas of land in the search of food and water. The breeding herds are led by their astute matriarchs who have learned where to find resources in desperate times. The conservation team has learned that these matriarchs have use Kwa Tuli reserve as a refuge for fresh water in the most barren times. The reason for this is because of the land owner's decision to pump water using windmills from boreholes underground to manmade water holes. A wonderful conservation initiative that has allowed many species to flourish in areas that were once lost to drought.

These oases have congregated elephant herds to one area; Kwa Tuli. Although enough water can be pumped to quench the ongoing thirst, elephants must also eat a huge amount of food each day and the effects on so many elephants on one area are easily noted in the damage to trees and vegetation.

Therefore the conservation team would like to disperse the herds from 2014 by adding more water holes throughout the Tuli Block in the hope that the herds will not be so reliant on Kwa Tuli. As these water sources have a direct effect on all other wildlife it will inevitably allow for biodiversity to increase in each area with a new water hole. As most other animals are territorial we hope for these new water holes to be able to retain water through the dry season and allow for existing territories to grow or for new territories and home ranges to open up.

12.2 Aims

- To counter act the advancing soil erosion throughout Kwa Tuli reserve and reverse the current trends.
- Disperse elephant herds from Kwa Tuli to all neighbouring properties.
- Allow for new water holes to gather rain water and retain it throughout the dry season and therefore decrease surface run off.

12.3 Methods

Areas that experience soil erosion will be targeted and preventative measures put in place. Whether these measures take the form of filling in gulley's or altering roads, volunteers and staff will manually do the work with the use of tools and machinery.

For the creation of new water holes or revival of old water holes again volunteers, staff and machinery will be deployed to perform manual work digging and working the earth.

12.3.1 Volunteers and staff filling in a gulley formed because of soil erosion.

13. OTHER PROJECTS

As with the management of any wild area there are several management practices that are essential to the maintenance of the reserve and ensuring it is a safe and practical environment for wildlife and researchers alike.

These projects include:

1. Tree wrapping - A practice where trees are wrapped with wire to protect their bark from elephant damage which can result in the death of the tree.

2. Fence Removal – As the land use of the area has changed from agriculture to a wildlife reserve there are still the remains of wire fences. This desolate wire can cause injury or death to wildlife so it must be removed.

3. Invasive plant removal – As non-native plants compete with natives for resources it is important not to let their populations grow and cause detrimental effects of the balance of the eco-system.

4. Roads Maintenance – As with any reserve, roads are essential but difficult to maintain. They constantly need maintenance on the surface and to keep back the encroaching bush.

14. IMPLEMENTING THE PLAN

As Projects Abroad places volunteers, interns and professionals into hundreds of projects worldwide, it is vital that these resources are deployed in a way that utilizes their strengths and coincides with the aims and objectives of the project.

To ensure all resources available to the project are being used correctly Projects Abroad employs staff on site directing the daily activities and ensuring research is being carried in accordance with this plan. Projects Abroad also has a conservation programme manager ensuring constant consultation with experts and the project is correctly managed.

15. REPORTING ON RESEARCH

Data collected at the project will be sent to Projects Abroad head office in the U.K. to be reviewed by the Conservation Programme Manager. Internal reports will be written using these data sets and made available to the public through a public domain.

When data sets are sufficient reports will be peer reviewed by leading experts with the aim of publication in scientific journals.

The project will also produce an annual report outlining progress and recommendations. The project will also feature in Projects Abroad's Conservation Annual Report, made available to the public through a wide range of media.