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Ecology of the Seboba Community Trust Nature Trail

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I. Abstract

Two students with the School for International Training, Amie Fleming and Erica Hann, conducted three weeks of field work in Kasane, Botswana gathering data about the wildlife species and grass species present along the Chobe River. An upcoming Community-Based Natural Resource Management (CBNRM) development project is planned for this area of land. The goal of this month-long study was to better establish baseline data on the types of plants and animals found within the area with the intention of developing recommendations for the project. We focused on creating a proposal for the route of a nature trail, along with bird hides and picnic areas planned. Although an Environmental Impact Assessment (EIA) was conducted for this project, it provided only the most basic information about local ecology and implications of the scheduled development, and our research sought to supplement its conclusions.

II. Acknowledgements

First, we must acknowledge the immeasurable amount of support we have received from Pete with our project. We would never have been able to produce a study as comprehensive and as meaningful without his guidance and patience. Although neither of us possess a strong background in ecology or science in general, we managed to complete an amazing scientific ISP from which we have learned an incredible amount. We are unable to thank Pete enough for essentially teaching us four different classes at once in three weeks. We must also thank Moses for accompanying us into the field and helping us to identify birds. Mark was another great resource and teacher, providing us with important skills at the site as well as a connection to the local community. We felt very welcome and will be sad to leave after such a brief stay. Of course, no one dedicated themselves to our wellbeing and happiness more than Simba and Matts. Their friendship made us feel at home in Botswana. From them, we have learned more than we imagined possible this semester, and we cannot imagine a better pair of teachers and friends to have had in Botswana.

To our group: you are the best. We have very few things we can say to you all to express how great you all have been as friends and fellow students, but we would like to say the following: (hold on, we're just getting over some egg in our mouths, sorry we know that's the lamest excuse you've ever heard.) But really, frogs will never seem quite as exciting at home, and we will miss Kelly Bo Haa a lot. This has been an unforgettable semester and we'll think of you when we sing "Climbing up the Mountain" or "Modimo Boloka." Even though we've heard them one too many times, we'll sing them to remember our time together abroad! Tune in next year to "American Australians take on all of your homes across the country". We're visiting.

III. Introduction

Botswana is a country in Southern Africa moving rapidly towards a state of heightened development. Kasane, a city in the north-eastern corner of Botswana near the border with Zimbabwe, Zambia, and Namibia, can be seen as a microcosm of this national trend; it is a small village that has been growing quickly to accommodate the tourism industry. Located on the border of Chobe National Park, one of Botswana's premiere tourist destinations, a number of foreign-owned lodges and companies have established themselves to service these international visitors. However, the government of Botswana wants to ensure that local Batswana also have access to revenue from the tourism industry, and uses programs such as Community-Based Natural Resource Management (CBNRM) to help achieve this. Under this program, villages and communities throughout Botswana can form Community-Based Organizations (CBOs) and apply for land to operate a development project, often tourism ventures. The first CBO was formed in 1994 in the Chobe Enclave area, and now almost one hundred CBOS are registered in Botswana (Johnson 2009).

The Botswana CBNRM policy states that using this style of management "embraces democracy and good governance as it involves devolution of authority and the development of accountable and representative decision-making institutions at community level" (Policy on CBNRM, Reader III). The objectives of the policy are to empower communities to participate in the tourism industry, and to create a more positive, and communal approach to land management through sustainable, locally-based development.

The Seboba Community Trust is a CBO in Kasane that recently acquired land from the government in order to develop a project of their own. The Seboba project was allocated 21

hectares of land, an area known as Commissioner's Kop along the Chobe River, to use for this project. The community seeks to develop a cultural village, as well as a system of nature trails and picnic sites for visitors to enjoy. The project has been designated approximately 10 million pula, and is working in conjunction with the Botswana Tourism Board and contractors from Gaborone.

Botswana law requires that all new development proposals complete an EIA. This document is intended to highlight any and all impacts that a particular project will have on the ecological environment, as well as to suggest mitigation for potential damages incurred. An EIA was conducted in the Seboba area in 2007-2008, and the report issued by the consulting agency describes the development site and potential impacts of development to some degree. Unfortunately, much of the information provided is nonspecific and fails to adequately assess the impacts of the Seboba community project on local flora and fauna. In order for successful, sustainable development to take place, a more detailed account of the local area is needed.

IV. Study Area

The Study Area is located along the Chobe River, between the Kasane Prison Farm and Mowana Safari Lodge. It is divided into five areas, or transects, for the purposes of our research. These will be referred to as Transect A, B, C, D, and E respectively.

Transect A

Transect A covers the easternmost area of the study site. It encompasses the strip of land between the Kasane Prison Farm fence and the river's edge, and stretches to the base of the hill. The amount of dry land varies considerably with seasonal floods. It is mostly composed of gallery forest, and becomes a more typical woodland savannah in the areas further from the water. Although the western edge of this transect is significantly degraded and there is evidence of human habitation and activity, much of the gallery forest is in relatively pristine condition. There is hippopotamus, elephant, baboon, and small ungulate spoor in this area, especially north of the farm.

Transect B

Transect B is composed of a hill, and an open field to the south. The hill reaches all the way to the river. The hill is relatively open woodland savannah, while the field is heavily degraded with little vegetation other than small grasses. There is also a large pile of gravel that has been dumped into the field and covers an area of around 75 square meters. Brick walls and cement platforms within this transect also indicate human activity. A dirt road has been established from the main road, cutting across the field, and down towards the water's edge. Similar to Transect A, there are also a number of elephant and hippopotamus trails crisscrossing the hill. This transect has the greatest variance of elevation; the rest of the site is relatively flat.

Transect C

Transect C is a Mopane woodland and bushveld environment, with a small amount of gallery forest bordering transect A. It stretches westward from the Prison Farm fence and ends at the open field to the east (transect B), and transect A to the north. It is the largest transect in the study site, but also has the most consistent composition. A very dry area, there is little evidence of human activity, although two elephants that had recently been hit by cars were shot and then left in the middle of the site. There were definite signs of animal activity including elephant, baboon, and hippopotamus spoor.

Transect D

Transect D is the narrowest transect as the water reaches within 10 meters of the tar road in some places. The river edge is primarily gallery forest, with fewer large trees than transect A, but with denser vegetation. The strip of land along the road shows evidence of human presence with litter and saw marks on trees. There are also many elephant trails that cross both north-south as well as east-west. Elephant, hippopotamus, and small ungulate spoor are common in this strip of land.

Transect E

Transect E is the westernmost transect. It follows the edge of Transect D, at approximately the Kasane Education Center sign, and continues west towards the Mowana Lodge property boundary. The western extension of this transect is delineated by the Mowana fence, and a private home. This transect contains a dirt road running approximately east-west, as well as some drainage systems originating from Mowana Lodge.

V. Methods

Our research sought to uncover more information about three areas: wildlife species present in the study site, grass diversity and density, soil type, and high water levels. The methods utilized varied for each type of data collected, and will consequently be discussed in separate sections. The results from this data were used to inform our design of the trail.

Bird and Animal Observations

In order to record the various animals, especially bird life, we first designed a series of transects across the study site. We divided the area into five distinct regions based loosely around different ecosystems, creating five corresponding transects (Appendix A, Figure 1). We also divided our study time into five periods: Early Morning (EM) from 6:30-9:00 AM, Late Morning (LM) from 9:00-11:00AM, Mid-day (MD) from 11:00AM-1:00PM, Early Afternoon (EA) from 1:00PM-3:00PM, and Late Afternoon (LA) from 3:00PM-5:30PM. With five transects and five times of day, we planned to collect data from all areas of the site at all times of day throughout three weeks of field work. Consequently, our results represent a relatively complete picture of the types of animals active in each of these areas during various times of day. We designed a data sheet to record the transect in which we were working, the time of day, the animal observed, its behavior, and other notes such as GPS location. We divided this work so that one person observed animals while the other studied the grass and soils at various points.

Grass and Soil Collection

With the help of our advisor, we systematically generated 100 points at which to collect this data across the study site, each placed 50 meters away from each other (Figure 2). At each point, which we located using a GPS, we created a 1 square meter quadrant and recorded all

grasses present. When a grass could not be identified, we recorded it as species A, B, C, etc and noted its characteristics. We also recorded the percentage of ground covered by grasses by using a tape measure to check for grass roots every 10 centimeters across the plot. Finally, we tested the soil at each site by gathering a handful of moist soil and rolling it into a small ball. We then poked the ball and if it fell apart easily, we recorded the soil as sandy. If it did not crumble, we documented it as clay, or Black Cotton soil. If it behaved anywhere between these two extremes, the soil was classified as loam.

Water-level Mapping

Water-level data was collected using a GPS. We walked along the edge of the water from the easternmost to westernmost point on the site and recorded a GPS point every 10 meters. If vegetation was too dense to take points every 10 meters, we stayed as close to the shore as possible to generate accurate water levels.

Map and Graph Creation

We created a variety of maps using ArcGIS software. By entering the GPS locations of the wildlife sightings, we were able to generate images showing wildlife density in a variety of different parameters, including species density across the site, bird versus non-bird sightings, sightings of various species guilds. The guilds we created are birds of prey, most commonly seen birds, mammals, observations of specific species such as the Hamerkop, Kingfishers, species of bee-eater and sensitive species like the African Finfoot and Pel's Fishing Owl. We used the maps of species density in order to help decide where bird hides should be located and the route the trail should follow to ensure good birding experiences for visitors. We divided the total bird counts by our reporting rate in order to prevent double counting from skewing our data. This

map uses graduated symbols to represent areas where the greatest number of species were documented, and marks sightings of uncommon species with a star symbol (Figure 3). Although we did not observe any of these uncommon species ourselves, a fellow student did record GPS locations of sightings of Pel's Fishing Owl and African Finfoot. We also created graphs showing wildlife diversity across the various transects and time periods included in our study.

In order to evaluate the data we collected on grass species and soil type across the site, we also used GIS software. We created one map showing percentage of grass cover across the area, another showing species diversity, and a third representing the three different soil types we found. The grass abundance in our plots ranged from 0-60%, and we divided our map into areas with 0-5% cover, 5-10% cover, 11-30% cover, 31-40% cover, and all cover over 41%. By shading each of these areas differently, we were able to establish which areas were more densely populated by grass. For grass species diversity, we designed a map which divided the study site into categories and shaded them in a similar fashion to the percentage cover map. The number of species found in each plot ranged from 0-6, and we used categories of 0, 1, 2, 3-4, and 5-6 species identified to represent our findings. When analyzing soil type, we also created a GIS map showing areas where each of the three soil types (sand, loam, and clay or Black Cotton soil) were recorded.

We created these maps to identify areas of especially high or low plant and animal diversity and to indicate the soil distribution. Based on these results, we designed a recommended development plan, including a proposed trail route and the location of other features of the project such as bird hides, picnic sites, rest bench locations, and the cultural village (Figure 4).

VI. Results

Species Observations

We evaluated species observations through a series of graphs and maps. The first graph (Figure 5) shows the animal species diversity- or total number of different species recorded- in each transect. We found that Transect B had the highest total number of animal species recorded (44), followed by Transects D (42), E (34), A (27), and C (21). Our next form of analysis involved comparing species diversity in each time slot (Figure 6). The results show that we observed the greatest variety of species during the Late Morning time slot (35), followed by Early Morning (33), Late Afternoon (31), Early Afternoon (18), and Mid-day (17).

Our results show that we documented 75 different species of bird, 4 mammal species, 1 snake, and 3 reptiles within the site. The 3 species of bird most commonly sighted were the Blue Waxbill (21 sightings), Swamp Boubou (18) and Little Bee-eater, (17). There were 7 sightings of birds of prey, which included: African Fish Eagle, Hooded Vulture, Yellow Billed Kite, and Bateleur Eagle. We recorded Hamerkop sightings 5 times and found a nest just off-shore north of the hill, and a potential nest site on the river's edge in Transect A (Figure 7). There were 3 different species of bee-eater within our site, and we recorded 23 sightings of bee-eaters over the study period. One species of interest is the Giant Kingfisher: BirdLife Botswana lists Giant Kingfishers are listed as an endangered species in Botswana, although not in the Chobe area (BirdLife Botswana). We saw Giant Kingfishers twice, and sighted kingfishers a total of 5 times. Two rare birds were documented within the site, the Pel's Fishing Owl and the African Finfoot (Figure 3).

Mammal species recorded in the site included baboon, buffalo, hippopotamus, tree squirrel, and waterbuck. The baboon species were seen both in the early morning and late afternoon time slots on the most eastern parts of the study area. There were approximately 50 baboons in the group both times. The waterbuck was seen in the western side, close to the Mowana fence. Though mammal sightings were sparse when compared to the number of bird sightings, there is a lot of spoor of larger mammals such as elephants all over the entire site, indicating a higher number of mammals utilizing the area than were documented during our research.

Grass Plots and Soil Types

We discovered that most of the site has a low percentage of grass cover, especially where animal and human activity is high. The highest percent cover was only 60%, with the vast majority of plots containing 40% or less cover (Figure 8). In terms of grass diversity, we found that Transect C had the highest number of grass species with 19, followed by Transect D with 15, B with 14, E with 12, and A with 0 species recorded (Figures 9, 10).

Black Cotton soil was the most commonly identified soil variety, and was found in 21 of the 51 plots, or 42% of the site (Figure 11). Black Cotton soil is common in damp areas, and so was most common along the edge of the floodplains and in depressions where rain water collects. Loam was the next most popular soil type and was found in 32% of the study area, in 16 plots. Sandy soil was found in 13 of the study sites, or 26% of the overall area.

VII. Discussion

Designing the Trail

The maps of wildlife sightings, bird guilds, grass density and diversity, and soil types represent how our results informed our decision-making process when designing the trail. The trail leads through multiple areas of high species density, but which avoids areas in which sensitive species like the Pel's Fishing Owl is known to inhabit. Most of the trail goes through areas of low grass cover, as it follows already established and degraded animal and human pathways in the area, but we also chose a route that passes by the area with the highest degree of grass species diversity. One suggestion we have is to place educational signs explaining the various grass species along the trail in this area. Finally, the trail route avoids areas of Black Cotton soil whenever possible (Figure 11). In the instances when Black Cotton soil is unavoidable, which occurs in a strip of flooded land in Transect D near the proposed Cultural Village, we suggest constructing a small bridge or elevated boardwalk to prevent a muddy, unusable pathway. We do not advise that these raised footpaths be utilized across the site because they will run perpendicular to elephant traffic towards the river. In addition to high initial costs, features like these will likely require expensive maintenance as a result of elephant damage.

Constructing the Trail

The physical structure of the trail is a critical aspect of this development project. The recommended trail follows degraded elephant and human pathways along sandy and loamy soil. Of the 29 species of grasses we identified in the site, the vast majority grow in degraded habitat. The most cost effective and ecologically friendly option is to maintain the preexisting pathways

through the site to avoid unnecessary disruption of the ecosystem. The bushes along side the trail should only be cleared if they directly obstruct the walk way; in fact, we designed the route to lead through already cleared areas. In sections where there are multiple elephant pathways, one solution is to plant additional sickle bushes along the trail. This will prevent tourists from straying off the trail as the bushes are thick and thorny, and provide an ideal environment for birds such as Blue Waxbills.

Special care must be taken while constructing the trail on the hill, as erosion and fauna degradation are likely. Most trail building sources state that the trail's grade should not exceed 10% to minimize erosion impacts (American Trails, Feb. 2008). In order for the trail to reach the top of the hill at this low grade, we recommend employing switchbacks. The trail should cut back and forth across the side of the hill to gradually reach the top. Disregarding this means the trail will encourage water to flow down a concentrated pathway, and will facilitate soil displacement and environmental degradation. Furthermore, to properly manage the trail, the uphill side should be brushed in: that is to say, additional vegetation should be planted in areas where it is currently sparse to reduce soil erosion across the trail. This will help minimize maintenance necessary of the trail. In areas where it is necessary to build at a steeper grade, natural means of building a staircase should be employed. On many trails in the eastern United States, boulders are moved to form a rock staircase up steep slopes. In other regions, logs are used to support steps made of soil. Each log is laid across the trail so that the soil behind it may provide a level step.

Another important feature that will help mitigate the environmental impacts of the trail is water bars. Water bars are an integral part of United States trail systems, but are also used around the world. The purpose of a water bar is to direct water down hill and off the trail so as not to

facilitate erosion along the trail. A water bar may be constructed in several ways. Since the trail will not be constructed straight up or down hill, there will always be an uphill side of the trail. On this side, there is a small ditch that is dug, much like the water drainage on the side of a road. The trail is slanted slightly towards the uphill side, so that water running downhill and off the trail runs into this ditch. Every 10 meters, a bar made of either a log or of rocks is created to guide the water across the trail and down the hill (Portland Water District, 2006). The benefit of adding water bars is that water does not accumulate on the trail and does not carry sediment downstream. It is highly advisable, given the large rainstorms that pass through Kasane in the wet season, to include water bars in the trail design on the hill. Failing to do so will result in excessive environmental damage along the trail. Another negative impact of not including water bars is that tourists will not want to walk through water that is collected on a trail. Many will attempt to walk around the puddles, and in doing so will create "braiding" along the trail- where individuals create their own trails along side the established trail. Trail braiding can lead to an impact several feet wider on both sides of the trail than the original tread (Wildlife Guidelines for Backcountry Tourism/Commercial Recreation).

Length of the Trail

The length of the recommended trail is shorter than the one described in the Seboba EIA. The community is interested in 10 km long trail, our trail is 2km. We recommend a smaller loop be constructed over the hill as it offers the best views of the river and the islands, and has well established pathways already. A longer trail will extend towards Mowana. We understand that in the dry season, the land extends out to the islands; however our trail stays on land above established high watermarks to avoid seasonal problems with flooding. This may not be the most visually appealing route in other times of year; however the trail runs through the areas where we

documented the highest species diversity, and the highest number of wildlife sightings. This trail meanders to try and maximize a tourist's exposure to different ecological environments, but due to the size of the site in the wet season, we feel the trail cannot extend to 10 km as there is not enough space to create a trail of that length that will remain interesting and stimulating to tourists. We do not recommend attempting to create a trail over the flood waters on raised platforms in an effort to extend the length of the trail; the force of the flood waters combine with Black Cotton soil will mean that the structures will suffer serious damage each season, and will require expensive repairs annually. There exist raised trails through tree canopies and over water in other parts of the world such as South America, however the seasonal changes in water levels creates a unique obstacle to the Seboba project and would utilize too large a portion of the allocated funds to make them a desirable feature of the project. We suggest that funds instead go towards educational signs along the trail so that visitors learn more about the trail as they walk.

Cultural Village, Bird Hides, Picnic Sites, and Other Features along the Trail

We think the best location for the cultural village is at the base of the hill. This area already displays serious degradation from a former road tarring project, and construction in this area will minimize the additional environmental impacts of the project. Our proposed trail will include several features: bird hides, benches, and picnic areas which are all features that reflect the desires of the community trust. We selected five different areas for bird hides that we feel maximize the potentials of wildlife and scenic viewing (Figure 4). Each hide coincides with high levels of bird observation and low expected degradation. We understand that visitors will arrive expecting to see animals, and we believe these hide locations will offer ecologically sensitive opportunities to do so. We ranked the 5 selected bird hide locations in order of the most to least desirable hide location. The most preferred site is along the eastern ridge of the hill, and

overlooks the islands (flooded during our study period). It also provides a good location to see water birds as well as bird species on and around the hill. Our second proposed location is near the first, on the eastern base of the hill, and is near a location where we sighted Little Egrets on multiple occasions. This bird hide would also provide views of the gallery forest area in Transect A, which is impractical for a trail due to the high degree of flooding and near-universal presence of Black Cotton soil, yet has a high avian population. The other locations, particularly in the western half of the site, may not be as active during other times of the year, but are at the location from which we viewed a heronry in the islands, in addition to a wide variety of bird species on shore. The benches we propose are often aligned with bird hide locations. We understand that bird hides will attract many visitors, and creating places for people to congregate without straying off of the designated trail which is important to protect the flora of the area. Lastly, we propose two different picnic site locations (Figure 4). The first location is at the base of the hill where we propose the cultural village be constructed. By combining the village and picnic site, we hope to contain the impact of human activity to a smaller area that is already seriously degraded. The second location is on top of the hill. There is a clearing near one of recommended bird hide locations that is relatively flat and cleared out. We estimate that the picnic area on top of the hill could accommodate approximately 12 people. It would also provide the "sunset moments" desired by the community in the EIA as visitors could eat their meal and watch the sunset, as well as view bird activity on the hill.

Comparison of Results with EIA

Before beginning our research, we had the opportunity to read a recently conducted EIA of the Seboba Community Development Project. Although the EIA provided a good deal of background information on the ultimate objectives of the project and discussed a variety of

potential environmental impacts and mitigation measures, the data it presented was much more limited than what we collected, and indicated an incomplete understanding of the local ecology. The EIA reported only 15 bird species in the area, while we found 75. Although there was a longer list of 30 non-bird animal species present in the area, the EIA failed to mention the abundance of hippopotamus in the area, a presence made apparent by the high density of spoor found, as well as an actual hippopotamus sighting. The EIA also only examined 17 plots to identify grasses and soil type, while our study encompassed 51 different plots. Overall, our study of the ecology was much more in-depth than the EIA.

The proposed development includes a fence enclosing the entire property (but open to the riverfront) in order to ensure that visitors pay for entrance to the area, as well as to protect the development from wildlife. Two elephant corridors were proposed on the east and west side of the area, and it was also suggested that communal access be maintained in certain areas like the baptism site and fishing locations (Figure 12). We did not agree with this reasoning since constructing a fence, especially one with no barrier along the river, will interrupt movement patterns of the local fauna, especially elephants and hippopotamus. We suggest instead that only the cultural village be fenced. Although the primary reason for fencing the property is to ensure that visitors pay for utilizing the site, we feel that lost revenue associated with fence maintenance would exceed the potential financial gains. The community could also create informative booklets and raise the cost of admission to the cultural village to account for this potentially reduced income. The trust is better off investing millions of pula into building awareness of the project with local lodges and safari companies to attract high paying clientele, and a steady source of business than constructing an expensive fence.

One final way in which our results and recommendations differ from those presented in the EIA surrounds the issue of how much development is appropriate in this area. The proposed project includes 3 different toilet sites, including public bathrooms at the main entrance gate. Other proposed features include 10km of trail, picnic sites with braai facilities and capacity to seat 90 people. Lastly, the community would like to construct a cultural village with 8 traditional houses and an open area for traditional dancing. Given how small the Seboba site is, especially during the wet season, it seems quite impractical to include all of these features in the site. We suggest eliminating the public toilets at the entrance and shortening the trail to our proposed length of 2km. This will greatly reduce the ecological impact of the development and costs associated with maintenance and initial construction would also be reduced. As explained previously, picnic sites should be restricted to the cultural village area and the top of the hill. This will keep waste generated by visitors contained in a smaller area, and should help alleviate potential human-wildlife conflict. If tourists are permitted to bring food into less well-protected areas, even if the entire site is fenced, it will increase the likelihood of attracting potentially dangerous and aggressive animals.

Ecological Implications

As with any development, the trail needs to be especially sensitive to resident animals. We have discussed birds sighted within the area, but a few other species must be addressed. First, elephants are among the most common animals in the Chobe area. Although we never saw an elephant at the study site, we encountered spoor in all transects, at every time of the day. We conclude that elephant activity in this area is high, which is supported by the elephant activity in the park and at the nearby seep. As a result, we highly recommend against fencing off the Seboba area. We realize there are economic incentives to fence the community- such as charging

user fees and keeping out intruders- but we feel that the elephants will not only utilize the designated corridors. Mowana experiences many problems with their electrified fence around the golf course and has to repair the fence frequently. The fence will be extremely costly, and will require regular maintenance and repair such that it will exceed the revenue income generated from fencing.

Baboon and hippopotamus are also residents of the Seboba area. As we mentioned in our results, there are 50 baboons that have been sighted on multiple locations within the sight. These sightings have been both in the early morning, and late afternoon. It is likely that the baboons spend the night in the trees along Transect A and on the hill of Transect B. Thus, we recommend that those using the trails use caution when exploring Seboba, because even with a fence around the property, baboons will continue to inhabit the area. Additionally, hippopotamus spoor are in every riverside transect, and we routinely found fresh spoor during our transect walks. Hippopotamus could be heard from shore several times, and are known to graze and sleep on land. While hippopotamus are not necessarily dangerous if they are spotted while in the water, they pose a serious danger to those caught between them and the water. It is with this in mind that we remind the Botswana Tourism Board that the project must face the likelihood that hippopotamus will wander onto land and could come into contact with visitors.

Another very critical resident in the area is the Pel's Fishing Owl. This owl's population is unknown according to BirdLife (BirdLife International, May 2010). The Seboba area, specifically Transect A, has been a known roosting site for this uncommon species: it has roost in the area two of the past four years which is very important for the community to protect. This is the only known Pel's Fishing Owl in this area of Northern Botswana. The African Finfoot is another rare bird and was also seen in Transect B. BirdLife's website says that the bird is

"threatened by habitat degradation," and that the species breeding "corresponds to peaks in water-level" (BirdLife International, May 2010). Any trail infrastructure in this area could thus have negative impacts to the current Finfoot population. Although our proposed trail runs close to the Finfoot sighting, it runs along the hill in this area and so provides ample space for Finfoot protection while also allowing visitors the opportunity to glimpse this uncommon bird (Figure 3).

Social Implications

In addition to the ecological implications of this trail development, there are several important social implications of the project. While walking through the site, we encountered several local fishermen and community members by the water. There is also a baptism site located in Transect D that is utilized by locals. As outsiders, we know that we cannot fully understand the community's relationship with this parcel of land, nor can we grasp all of the economic incentives associated with development. However, after studying CBNRM in the country for three months, and studying specifically at Seboba for a month, we feel that the community could be negatively affected by the project. Local access to the river will be restricted. Locals may not enjoy the same freedom to visit the river and utilize the natural resources like fish when there is a fenced development. Furthermore, culturally significant locations like the baptism site may be altered by the presence of tourists to the area. We hope that there are sensitive and thorough discussions among the local community and within the trust on these subjects to keep the community's best interests at the heart of the project.

To mitigate this potentially negative impact, we suggest that the members of the trust be granted reduced or free entry into the project so that they may remain connected with the land and the project. The inclusion of the local community will also contribute to the vitality of the

project, as we hope that children will grow up appreciating this tract of land, and want to continue supporting its operations in the future. Another option would be to offer environmental education programs in involving the Chobe Secondary School which is located very close to the site. Students could be encouraged to learn about a bird or plant species of interest, visit the site, and offer presentations to their peers about what they learned. This kind of interactive learning could be a huge benefit of creating a nature trail on the Seboba land, and would keep the greater Kasane community (not just the visiting tourists) interacting positively with their land. In fact, a review of CNBRM conducted in 2003 indicates that CBNRM projects have "contributed to improved attitudes of local communities towards wildlife and other natural resources" (The Way Forward for CBNRM in Botswana, Reader IV).

The project is being developed as a profit-seeking enterprise, and the potential revenue generated from the project is another potential benefit for the community. Other CBOs in Botswana have used revenue from their CBNRM development to provide water to all households, scholarships for students, and assistance for the disabled and orphaned population (Johnson 2009). The Sankuyu Tshwaragano Community Trust has been able to install a booking office for their tourist operations and create jobs for local community members (A Way Forward for CBNRM in Botswana, Reader IV).

However, one of the major problems associated with CBNRM is financial accountability of Trustees and transparency within CBOs themselves (A Way Forward for CBNRM in Botswana, Reader IV). The Board of Trustees in each CBO is responsible for facilitating the management of funds generated by CBNRM, yet there have been problems associated with how these funds are allocated and often revenue is not reinvested into the community but pocketed by trustees. Professional accountants and a system of auditing have been employed, but do not

seem to be effectively containing the problem. For example, in 2009, only 21 percent of CBOs underwent an audit of their financial accounts in 2009, and only 17 CBO Boards of Trustees reported the results of the CBOs financial audit to the Trust members (Johnson, 2009). These statistics indicate the potential for economic mismanagement and highlight the lack of information provided to community members about the economic health of local CNBRM ventures.

Although our research did not explore the structure of the Seboba Community Trust, the above figures indicate the potential impact of revenue generation as both a positive and negative force for community well-being.

Limitations of the Study

It is important to discuss the potentially problematic components of our research in light of our results. Our limited time frame meant that we were only able to conduct three weeks of field research. The presence of dangerous animals also constrained our field work; on two occasions we had to delay research because of a large baboon troop and we were unable to remain at the site past 6 PM due to the high degree of elephant activity in the area. Another important limiting factor was our lack of expertise in the areas of wildlife and grass identification. We were unable to identify multiple species of birds and grasses found in the area, which means that our data is not as complete as that which would have been collected by someone with more expertise. The high water levels also presented an obstacle to our work, mostly in the area of grass and soil plots. We were only able to collect data from two of the plots generated in Transect A due to the high flood levels, which helps to explain the lack of grasses recorded in that site.

VIII. Conclusions

The Cultural Village and Nature Trail development has a lot of potential to bring visitors to a beautiful part of Kasane in a way that will benefit the local community. The trail in particular, if completed in a sensitive and thoughtful manner will be a good addition to the mainly vehicle-based tourism of Kasane. However, we stress that without consideration of our observations, there is potential for serious environmental damage. The trail should follow areas that are already impacted such as the elephant footpaths, and should be restricted to the most durable surfaces (sandy and loamy soils). Bird sightings correspond well with our proposed trail, and we hope that the Botswana Tourism Board will take into account our data when constructing the trail. An invasive concrete path, or raised wooden platform is neither necessary nor desirable in the site. A fence around the area will be a costly expenditure that could be avoided in favor of more productive and interactive projects for visitors. Special care must be given to the trail on the hill, as the heavy foot traffic and erratic rainfall during the wet season could lead to serious erosion of loose soil.

We understand that many decisions being made regarding the project will be made based on forecasted economic incomes. However, if ignored, the ecology of this area could pose serious problems to the efficiency, appeal, and success of this new operation. We hope that the data we have compiled and the associated conclusions will help the community make the most informed decision possible.

IX. Recommendations

This research project has revealed a high concentration of wildlife, particularly birds, in the Seboba area. It was also conducted during a time of year when the flood levels are high. In various seasons, the conditions at the site will change considerably. It is critical that this project be repeated during other times of the year to document the changes in wildlife in the area, of the water levels, and of the grass and soil types growing within the site. Without a repetition of our project, our results alone will provide insufficient data to those constructing and operating the development. Ideally, this project should be repeated as frequently as possible to monitor changes on our baseline data, but we recommend a minimum of once every wet and dry season BirdLife and Caracal have reported that they would be happy to assist other students in conducting this research. We recommend that another SIT student (or two) dedicate their ISP to gathering data on the wildlife and grass species present, as well as their abundance, soil types, and high water marks. Our five transects can be used to delineate transect walks, and we hope that our five time slots will be used again so that data can be collected from all times of the day, in line with our study. It is vital that a careful and informed decision be made by the Seboba Community Trust and their development partners such as the Botswana Tourism Board regarding the location of the proposed development. In order for CBNRM to function effectively and fulfill its goal of sustainable development, decision-makers should have a complete picture of the ecological implications of community development projects.

We hope that our recommendations will continue to prove the best options for Seboba, but also hope that additional research will provide the necessary information for the community to make an informed decision about how best to develop their cultural village and trail project.

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