

Darwin Initiative Annual Report

Darwin Project Information

Project Ref Number	13/001
Project Title	Conservation of wetlands and associated biodiversity in Northern Zambia
Country(ies)	UK and Zambia
UK Contract Holder Institution	University of Aberdeen
UK Partner Institution(s)	Holly Hill Trust
Host country Partner Institution(s)	Kasanka Trust, Zambia (KTL)
Darwin Grant Value	131,669
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Project Leader Name	Professor P.A. Racey
Project website	www.kasanka.com
Author(s), date	Professors Paul Racey & Chris Soulsby Drs. Glenn Iason & Mike Kennedy Messrs Edmund Farmer & Martin Stanley April 2006

1. Project Background

The project is taking place in Kasanka National Park (KNP) in Northern Zambia, one of two independently run parks in Zambia. The conservation concern is that despite seasonal inundation of grasslands during the rains, and rivers that never dry, some of the distinctive habitats in the park, the papyrus swamp and the mushito evergreen swamp forest, may be drying out as a result of increased climatic variability, and their distinctive biodiversity threatened (sitatunga and straw coloured fruit bats respectively). The established management practice of seasonal burning may also interact with these hydrological considerations and influence habitat dynamics and sustainability. Now that internationally competitive tourist accommodation is available there is also a need to enhance the capacity of the park to attract tourists by training environmental educators and guides, and to make the fullest use of the distinctive niche occupied by KNP.

Although this project is supported by three years of DEFRA funding, to delay in identifying and appointing a postdoc with expertise in both hydrology and grazing ecology meant that the inception of the main scientific part of the project was delayed by a year and permission was successfully sought from the Darwin office to extend the life of the project by that year. This involved no extra costs to DEFRA since the final year of the project will be funded by the accumulated donations from the UK partner – The Holly Hill Trust. As agreed with the Darwin office however the final report will be provided on completion of the project in a year's time.

2. Project Partnerships

- The host country partner is KTL Zambia which is based in Lusaka, but holds an annual management meeting at KNP, the day after the Darwin Stakeholders Workshop, so that UK partners (P. Racey and M. Stanley) can attend as observers.

In practice, the partnership involves regular email exchanges between the UK partners and Edmund and Kim Farmer, who manage the park. Edmund suggested that in addition to annual visits to KNP, P. Racey and M. Stanley should visit a park on the main tourist circuit, in order to have something against which to compare the guiding, hospitality and general visitor experience at Kasanka. He arranged a bargain package of Robin Pope's Safari Lodge in South Luangwa for two nights and provided aeroplane transport. This visit served to reinforce long-term goals and expected potential for Kasanka and our only regret is that we should have done this earlier in the project.

- The partnership between the two UK partners, Aberdeen University and Holly Hill Trust, has been strong and active from the outset with frequent email contact and meetings between P. Racey and M. Stanley. M. Stanley's support for KNP predated the present Darwin project, and he has provided a point of contact between the project and Kasanka Trust UK (which aims to raise money for KTL). P. Racey and M. Stanley always coincide their visits to KNP, and liaise over support for and visits to the project-supported Masters student at DICE.
- The principal challenge to the partnership and what it has been trying to achieve at KNP is the lukewarm attitude of ZAWA senior management, who despite being invited, have not attended the last two stakeholders workshops at KNP. ZAWA impose a significant bed levy on KNP. In the last year ZAWA have granted a safari licence for a Lusaka-based company to take animals in the GMA and included two buffalo in the hunting quota. A small number of buffalo had been reintroduced to the park by KTL and have not yet increased in numbers sufficiently to allow such hunting. The safari company constructed their camp in the GMA suspiciously close to the KNP border and tyre tracks have been seen leading into the park.....

Mainly as a result of ZAWA's non attendance at stakeholders workshops, Martin Stanley wrote a letter of complaint which was passed to ZAWA by KTL Trustees in Lusaka. A reply is awaited

- Does the project have a link with the CBD focal point?

No

Other Collaborations

This is the first Darwin project exclusively in Zambia, and remains the only one. The project is peripherally involved with of the UNDP/GEF-funded project: "Reclassification and Effective Management of Protected Areas" which involves *inter alia* Luvushi Manda, a national park in need of rehabilitation

- On arrival in Zambia, Mike Kennedy established contact with Dr Henry Sichingabula, Senior Lecturer, in the Department of Geography, University of Lusaka. He is a river geomorphologist with similar research interests. This has developed and Dr Sichingabula now represents the leading partner institution on a DELPHE application to The British Council, being coordinated by Dr Kevin Murphy of The Department of Environmental and Evolutionary Biology, and which involves P. Racey. A draft of this application is included in materials sent to ECTF.

3. Project progress

3.1 Progress in carrying out project activities

3.1.1 Hydrological and Fire Management Plan

The main body of research at sites within the park and its immediate surroundings has continued, and involves monitoring of water chemistry at a range of sites. In addition, controlled burning experiments have been implemented to investigate the impacts of fire on potentially vulnerable habitats, and on some of the large grazers that utilise these habitats.

At the outset of the field programme, sites within the park and on its boundaries were identified for hydrological monitoring (See Appendix 2 for site locations).

These sites represent a variety of shallow lakes, rivers, and seasonally inundated (dambo) wetlands. A number of wells and boreholes are also monitored to assess the chemical characteristics of different groundwater stores.

Controlled burning experiments are also being carried out in areas of miombo woodland, termite-dominated grasslands surrounding seasonal wetlands, and in the seasonally flooded areas themselves. The experiments are designed to compare the hydrological and ecological effects of early burning (following the wet season), late burning (preceding the onset of the wet season), and absence of burning.

3.1.1.a Sampling regime to establish the hydrological characteristics of the KNP

The hydrological investigation in the park has been ongoing and is currently planned to continue till late 2007 i.e. October (or will be ongoing if continuation funding is obtained). Sampling has been conducted on a regular basis since September 2005 (with an initial water quality sampling survey of the park being undertaken in May 2005). During the 2005/06 wet season a total of four locations (Mulaushi -Kasanka Research Centre), Mulembo air field, Wasa Camp and Chikufwe air field: (see Appendix 3, Figure 1) had rain gauges in place which were monitored for the full duration of the season. Four more sites (Fibwe, Kabwe, Pontoon and Luwombwa Camp) were gauged and monitored from the beginning of January 2006.

During the 2006/07 wet season the number of gauged sites was increased to include more in the park, plus sites outside the park. All seven sites monitored during the 2005/06 wet season were monitored for the duration of the 2006/07 wet season. Two sites in the park instrumented during the 2006/07 wet season (Kasanka B and Chantete) did not yield reliable rainfall datasets due to unexpected removal of camp staff. Three further sites outside of the park have been successful in engaging local schools in data collection (Kafinda School, Chalilo School and Mpelembe School). Data at Mpelembe and Chalilo Schools has been shared with the local agricultural extension officers.

Through monitoring rainfall levels in the park we have been able to begin to understand spatial variability in rainfall, and variability between years. The 2006/07 season has been exceptionally wet (a condition reflected across the northern half of Zambia and the sub-region as a whole). Rainfall is recorded daily at 0800h

The four sites which have been gauged during the 2005/06 and 2006/07 wet seasons show that rainfall is not uniform across the park, despite its relatively small size. All sites received less than the regional average annual rainfall (1200mm) during 2005/06, and above average rainfall during 2006/07. Mulaushi, which received the highest rainfall of the four sites during 2005/06, received the lowest during 2006/07 (see Appendix 3, Figure 1).

All eleven sites monitored for the duration of the 2006/07 wet season (though it should be noted that this is ongoing) have received rainfall well above the regional average, with a current average total for the year of 1560mm (Appendix 3, Figure 2). Sites such as Fibwe have experienced extremely high rainfall levels for the season (1876mm as at 28th March). Rainfall at Chikufwe (1400mm as at 29th March) is well above the 2004/05 wet season total, and almost double the 2005/06 total (Appendix 3, Figure 3).

From data collected at Wasa camp since 1988, it is clear that rainfall has exhibited high temporal variability (Appendix 3, Figure 4). In the last 19 years, rainfall has only exceeded the regional average rainfall levels on four occasions (1992/93, 2000/01, 2002/03 and 2006/07). During the majority of wet seasons since 1988, rainfall figures have been below average.

The spatial and temporal variability observed in the rainfall patterns across Kasanka highlight the vulnerability of the wetland habitats. The data also highlight the need to understand seasonal inputs and local flow pathways of water into and between these freshwater and associated habitats (and how the impact of changed rainfall patterns on their survival might be predicted). Water quality monitoring has been carried out at up to 35 sites (Appendix 2) depending upon whether they have annual flow, or are accessible during the wet season. Electrical conductivity and alkalinity are employed as tracers of water source and flow: conductivity indicating the concentration of dissolved solutes in the samples, and alkalinity indicating strength of acid buffering capacity derived from geochemical weathering activity. Low values for conductivity and alkalinity imply a strong influence of recent rainfall on the water body, and high values indicate longer contact times with catchment soil and geological formations (i.e. groundwater). Stable isotopes of oxygen are also being used to further discriminate between water sources. The findings so far suggest that rivers such as the Kasanka appear to have a relatively high groundwater component contributing to flow during the dry season (Appendix 3, Figure 5), supplemented by rapid influx of recent rainfall during the wet season. Others such as the Luwombwa (Appendix 3, Figure 6) appear to be fed largely by rainwater, or at least from sources which have a lower groundwater component. This is clearly shown by the much higher conductivity values generally observed for the Luwombwa borehole (which is sited approximately 20m from the main river channel). However, with similar conductivity patterns seen in the river and the groundwater in response to initial rainfall during the 2005/06 wet season (i.e. a rapid increase in values), this suggests a degree of connectivity between the river channel and groundwater, rather than a total isolation of the two hydrological units.

Other channels such as the Musola stream and Mulembo River have characters which tend to change during their passage through the park. The Musola (Appendix 3, Figure 7) is sampled at its entry into the park (Inlet), and at a central point near to the beginning of the main swamp area (Fibwe), which is *Sitatunga* (*Tregalaphus spekii*) habitat and is adjacent to the main mushito forest roost of the Straw Coloured Fruit bats (*Eidolon helvum*). At both these locations conductivity is generally below 100 μ S (with the exception of initial flushing in response to the beginning of the 2005/06 wet season), indicating relatively minimal groundwater influence. However, the third point (Kas Conf) occurs after the stream has passed through the main body of the swamp, just prior to it joining the Kasanka River. The higher values measured at this point (generally well above 100 μ S, and in excess of 500 μ S during the 2005/06 wet season) indicate interaction with the swamp, groundwater interaction, and possible mixing with the water from the Kasanka river channel. This has implications for management of such wetland areas, whereby quality and quantity of both groundwater and rainwater inputs (via channel flow) need to be protected, and seasonal variability of inputs taken into account.

The Mulembo River, which forms the northern boundary of the national park, exhibits similar hydrological characteristics (Appendix 3, Figure 8). Mulembo Village (Mul Vil) and Chantete

Camp (Chan) are the points of entry to the park and an intermediate point respectively, and exhibit relatively low annual conductivity levels. However, near the point where the Mulembo joins the Luwombwa, conductivity increases, especially during the dry season. As the conductivity of the Luwombwa is low in comparison, this increase in conductivity is likely to be due to interaction with local wetlands, or represents a groundwater input.

There is also evidence to suggest that some of the main lakes within the park are maintained, to a degree, by groundwater inputs. The seasonal conductivity characteristics at Wasa Camp show similarities between the shallow (approx 5m) wells, and the deeper borehole. These characteristics are also reflected in conditions seen in Lake Wasa I (Appendix 3, Figure 9). However, the lower conductivity values measured in the lake suggest that rainwater is probably more important in maintaining the water body.

Seasonal responses of freshwater systems, and the influence of dry periods on water quality are also indicated by the data collected so far.

Most of the water bodies sampled (e.g. Appendix 3, Figures 5 to 9) appear to show a distinct dilution by rainwater following the first rains of the 2005/06 wet season. This follows a relatively dry period, with the two preceding wet seasons having had well below average rainfall (Appendix 3, Figure 4), and there is a short time lag seen in this response in the deeper groundwater deposits (e.g. Appendix 3, Figures 6 and 9). This situation in most cases was followed by a rapid increase in conductivity, which is possibly a result of flushing of re-mobilised nutrients and weathering products from the soil matrix. This will be accentuated by the limited vegetation growth and nutrient uptake at this early stage of the wet season. Conductivity values then dropped off once again, possibly as a result of continued dilution by rainwater as the wet season progressed. On-going isotope analyses is expected to clarify the relative importance of the processes involved.

Although rainfall was still below average during the 2005/06 season, it was higher than for the previous two seasons, and this may have resulted in some recharge of groundwater stores and surface water bodies, which persisted during the 2006 dry season. Indeed, an apparently more rapid recharge of various wells and boreholes was observed following the onset of the 2006/07 season than for the previous 2005/06 wet season (Appendix 3, Figure 10). As a result, the apparent dilution and flushing observed during the 2005/06 wet season seems to have been greatly 'damped' during 2006/07.

River levels have also been monitored at seven stations from the beginning of the 2006/07 wet season. The Kasanka was gauged at Kasanka B, Pontoon and Kabwe camps, the Mulembo at Chantete Camp, the Musola at Fibwe Hide Camp, the Luwombwa at Luwombwa Camp, and the Mulaushi stream (a tributary of the Mulembo) at Kasanka Research Centre). All gauges (with 3m scales and 2cm sub-divisions) were hammered into the riverbed and tightly secured to large trees using wire. However, due to extreme flooding of the Kasanka (and its adjacent floodplain), the gauge at Pontoon was swept away during February 2007, and the gauge at Kabwe has been inaccessible. The data are also intermittent for Chantete and Kasanka B sites due to unexpected removal of camp staff.

However, once processed, the river level data obtained will allow us to assess the replenishment of the main channels running through the park following the beginning of the wet season, and – when combined with the tracer data presented above – quantification of the contribution of rainwater and groundwater to these flows, and possible interactions of the rivers with wetland areas.

In addition to the field programmes of hydrological sampling and burning experiments, tensiometer nests have also been installed at Wasa Camp (Since March 2006), at Kasanka Research Centre (since October 2006), and around Wasa I dambo (since October 2006). Wasa I dambo tensiometers are alongside a sub-set of treatment blocks in each of the miombo, termitaria (Appendix 3, Figure 11) and seasonally wet grassland habitat types. Research Centre and Wasa Camp tensiometers are located at the upper edge of seasonally wet areas.

The tensiometers being used measure suction within the soil at set depths, by way of water leaving a porous ceramic cup inserted into the soil, at the base of a sealed tube filled with water. This suction is indicated in Millibars (Mb) on a dial at the top of the sealed tube.

Data from Wasa camp (Appendix 3, Figure 12) show that soils closer to the surface (30cm deep), began to dry in mid April 2006, soon after the end of sustained wet season rains (the final two, isolated, rainfall figures being 34mm on 25th April, and 6mm on 22nd May 2006). Soil at a depth of 60cm retained moisture for a longer period, until mid May. Soil had dried out to a large degree by July 2006, and tensiometers were drying out within a day by August 2006, making recording difficult and indicating extremely dry soils.

3.1.1b Ecological monitoring of vegetation growth under contrasting burning regimes

Ecological monitoring of vegetation growth has also paralleled the hydrological studies. Twenty blocks (five replicate blocks across four habitat types) were established prior to the last annual reporting period in the complex of enclosed dambos surrounding Wasa Camp (see Appendix 2). Replicate blocks within miombo, termitaria grassland and seasonally wet grassland each have three treatment plots (early-burn, late burn and no-burn), while those in permanently wet grassland comprise only single control (no burn) plots. Therefore, there are a total of 50, 15m by 15m treatment plots (see Appendix 3, Figure 11; Appendix 9, Figs 2 & 3). These are currently being monitored for a number of vegetation and environmental variables including biomass, vegetation height, average stem density and diameter, and soil moisture. Firebreaks were established around all plots, except for those in the permanently wet areas, by hand slashing. These firebreaks have proven successful in protecting the plots from routine burning carried out as part of the current park management during 2006, and from accidental fires, while the proximity of the plots to the Wasa lodge has protected associated equipment from damage by poachers. Firebreaks will be re-cut when current floodwaters have receded. (See Appendix 10)

Early burn treatments were carried out within the (randomly) selected plots within each replicate habitat block during June 2006 (the routine early burning in the park was generally delayed due to wet conditions and a relatively late finish to the rains). Late burn treatments were carried out at the end of September 2006. Within Wasa I, the grassland plots had very short vegetation, and therefore burns were largely incomplete or not possible.

In order to provide an idea of the impact of burning on soil moisture properties, prior to burning, soil moisture readings were taken in each plot. Immediately following burning these measurements were repeated. The aim was to gauge the potential impact of early and late burning (i.e. drying of surface soils, or potentially drawing moisture up from deeper soil by capillary action). Consideration of such details will help inform soil and soil moisture conservation, especially through appropriate timing of burning.

Exclosure cages were constructed and deployed in all miombo, termitaria grassland and seasonally wet grassland treatment plots (but not permanently wet plots) during June and early July 2006, to allow quantification of above ground net primary productivity and grazing offtake by large grazers in different habitats under different treatments (Appendix 9, Fig 1). Monitoring has been carried out by taking paired standing crop samples (1m by 20cm) from inside each cage, and from a site adjacent to the cage (generally within 1m). Replicate vegetation heights,

stem diameters, tussock density counts and counts of stems per tussock (to give an estimate of stem density) have been measured in each of the paired sample areas. In order to give an estimate of vegetation offtake by grazers, the entire standing crop has then been removed from each paired (1m by 20cm) sample area, and on return to the lab at Kasanka Research Centre, has been sorted into live and dead material and each component weighed. These have then been dried in a specially constructed drying tent and reweighed when dry.

Some problems have been encountered with elephants disturbing enclosure cages, either by knocking them over, or dislodging and moving them. In such cases, only samples representing areas not protected from grazing (i.e. outside of cage location) have been collected. The cages appear to have been strong enough to withstand the effects of disturbance by other grazers such as Puku.

A placement student, Victoria Paterson, is setting up separate trials to look at the possible application of deterrents to elephant disturbance which will not affect ungulate grazing behaviour (see 3.1.3b & 3.1.5).

Vegetation surveys were carried out in each plot in June 2006 (3 random quadrat surveys per plot, giving a total of 150 quadrats). Many species of grass, and certain other species were collected which could not successfully be identified due to a lack of a comprehensive flora for the region. Samples of these were collected, given a unique label, dried and kept for later identification. A further survey was due to be carried out in January 2007, but has been delayed due to deep flooding of all seasonally wet grassland plots, and a majority of termitaria grassland plots. It is hoped to conduct the work during April 2007. All unidentified samples from both sampling exercises will be taken to the herbarium at the Forestry College in Kitwe for Identification. Lackson Chama (Research Assistant) has previous experience of using this facility.

Preliminary results from the biomass sampling within trial plots are shown in Table A. The results relate to sampling carried out during December 2006, which captures the response of the vegetation in the trial areas to the initial rains for the 2006/07 wet season. These rains followed the early and late burning treatments of 2006 (see Table B), and during the intervening period vegetation growth was minimal. Due to problems with the electronic scales, weights for successive sampling periods have not yet been obtained, and cannot be presented here. New scales have been sourced and unweighed samples are being kept safe in the meantime.

Within the miombo plots (samples of which contain herbaceous material and low lying woody material) it appears that overall biomass is lower in the non-burned areas than for either of the burned treatment areas. The proportion of dead material is also much higher in the unburned treatment plots, and lowest in the late burn plots. The early burn plots are intermediate, with around six times the amount of live to dead material comprising the standing crop.

The converse is true of the no-burn and early-burn treatments, and the proportional differences are also very low in terms of live to dead ratios.

The total standing crop is greatest within the termitaria habitat type, and the lowest biomass values in the case of both the termitaria and grassland plots is within the early burn treatment plots. This may indicate a greater offtake of the new vegetation produced following early burn treatment, or differences in primary productivity. This will be clarified when we are able to look at net primary production and grazing offtake (i.e. amount of biomass consumed by grazers) by comparing figures outside and inside the enclosure cages. The proportions of live and dead material comprising the total standing crop are largely similar between the termitaria grassland and grassland habitat types. In the December 2006 sample, in all cases, the proportion of dead material is highest in plots where no burning was carried out, and lowest in plots where late

burning was carried out. Late burn treatments in both these termitaria and grassland habitat types appear to result in a greater proportion of live to dead material within the total standing crop, as compared to early-burn and no-burn treatments which are similar.

While one sampling session alone (i.e. December 2006) is providing interesting results with regards to the effects of timing of burning, it will be instructive to compare the results across seasons, and especially well into the wet season when grasslands become inundated. However, these preliminary data suggest at this early stage that it will be necessary to reconsider the policy on seasonal timing and frequency of burning and vary it according to habitat type.

Table A. Average biomass (live vegetation), necromass (dead vegetation) and total standing crop values, and Live to Dead ratios for three habitat types, *Miombo* woodland, *Termitaria* grassland and seasonally inundated *Grassland*, under different burning treatments, measured in December 2006.

	Treatment	Biomass (g/msq)	Necromass (g/msq)	Standing Crop (g/msq)	Live:Dead Ratio
Miombo	Early Burn	80.5	13.0	93.5	6.2:1
	Late Burn	96.5	6.0	102.5	15.9:1
	No Burn	59.0	41.5	100.5	1.4:1
Termitaria	Early Burn	64.5	179.0	243.5	0.4:1
	Late Burn	86.5	17.5	104	5:1
	No Burn	69.0	234.5	303.5	0.3:1
Grassland	Early Burn	60.0	67.5	127.5	0.9:1
	Late Burn	90.0	11	101	3.2:1
	No Burn	130.0	141	171	0.9:1

Burning plot monitoring is ongoing and progress in terms of major sampling efforts is outlined in Table B, below.

Table B Work plan followed to date, showing major sampling activities undertaken within experimental plots. (*Soil moisture probe was out of operation from June to November 2006)

	2006												2007			
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
Soil Moisture*	■	■		■		■						■	■	■		■
Vegetation Height		■		■		■	■	■		■		■	■	■		■
Early Burn						■										
Late Burn									■	■						
Plot Species ID						■										■
Biomass (& associated) - (Paired biomass)			■	■		■			■			■		■		■

■ = Undertaken

■ = Imminent

3.1.1.c Synthesis of hydrological and ecological data and allied activities

There is an obvious importance to understanding localised hydrological flow pathways, and water sources and flow within the park as a whole. Investigations so far are shedding light on these factors. Meanwhile, it is important to understand impacts of burning, and it's timing

large herbivores. Our controlled experiments are addressing these issues.

By gaining an understanding of the overall hydrology we should be able to assess risks to valuable wetland habitats in Kasanka, and how potential threats might vary in relation to changing rainfall patterns. We should also be able to predict how much combustible material might be present at various stages within the dry season, in relation to the prevailing hydrological conditions of the preceding wet season. This will help inform how burning should be tailored to minimise negative impacts (if burning is considered unavoidable, or indeed, desirable in certain situations).

3.1.1.d. A feasibility study for a future hydro-ecology research project on the response of sitatunga to hydrological change

To date, attempts to raise funding (via the Royal Geographical Society and National Geographic) for a project to investigate the hydroecology of Sitatunga have been unsuccessful. A proposal to the Leverhulme Trust is currently in preparation.

3.1.2 Stakeholders workshop

Paul Racey and Martin Stanley visited KNP from 29th November to 4th December 2006. A day long stakeholders workshop was held on 30th November, chaired by Mr. Martin Stanley and attended by 16 people as follows:

Name	Position	Organisation	
Martin Stanley	UK Project Partner/Trustee	Holly Hill Trust	Chair
Dr. Mike Kennedy	Darwin Researcher	Aberdeen Univ./KTL	Secretary
Manjata Manjata	Vice chairperson	Chitambo C.R.B	
Andrew Mukupa	Park Ranger	ZAWA	
Victoria Paterson	Student researcher	Glasgow University	
Milton S. Sakala	Council secretary	Serenje District Council	
Dolly Chanda	Comm. Rel. Officer	KTL	
Frederick C. Mbulwe	Comm. Rel. Co-ord.	KTL	
Derick Chalwe	Councillor	Serenje District Council	
Edmund Farmer	Host Country Partner/Park Manager	Kasanka Trust	
David Lloyd	Acting Chairman	Kasanka Trust	
Prof. Paul Racey	Project leader	Aberdeen University	
John Hudson	Trustee	Kasanka Trust	
Leslie Reynolds	Guide Trainer	KTL	
Clifford Kadunga	Guide	KTL	
Kim Farmer	Projects co-ordinator	KTL	

The minutes of this meeting are attached (see Appendix 4).

Paul Racey, Martin Stanley, Mike Kennedy and Lackson Chama also attended the Kasanka Park Management meeting held on 1st December. Mike Kennedy gave an overview of progress for those who had not been able to attend the stakeholder workshop held the previous day.

3.1.3 Training

3.1.3.a Research Assistance

Lackson Chama has continued to work as research assistant on the project, and took responsibility for data collection when Mike Kennedy was on home leave, and carried this out to Mike's entire satisfaction. He has received driving lessons and passed his test in January 2007. Although he has been fully trained in the research techniques used by Mike, he would benefit greatly from a broader training and is next "in line" after Dolly Chanda as a nominee for a Darwin Fellowship

3.1.3.b Student supervision

Victoria Paterson is working on a placement at Kasanka as part of her five-year M.Sci. degree course in Zoology at Glasgow University, UK. She arrived in August 2006, and will be at Kasanka until late June 2007. She has been closely linked to the Darwin project, helping to carry out sample collection and processing, and data input. She is currently working with the

community project in setting up chilli fences within the Kafinda GMA, in order to prevent crop raiding by elephants.

Victoria is also in the process of setting up trials to investigate whether chilli fences affect the behaviour of grazers such as puku (i.e. whether they are deterred from grazing close to a fence or cage that is treated with chilli oil). This will also assess the possibility of deterring elephants from damaging structures such as enclosure cages in future experiments, without affecting the behaviour of Puku or other large grazers.

Two students from HAS Den Bosch, University of Professional Education, The Netherlands, Pauline Smit and Janneke Steens, carried out 8 week internships, overseen by Mike Kennedy, during February and March. The students were looking at puku distribution by direct observation, and from dung counts in miombo and termitaria trial plots (see earlier Ongoing Research section). A plan of approach document put together by the students following initial discussion with Mike Kennedy is provided as Appendix 8. The final report is awaited.

3.1.3.c Guide training

Leslie Reynolds has produced a guiding manual (a hard copy of which is included among materials sent to ECTF).

Kasanka has just experienced the ‘quiet’ rainy season. The record high rains restricted movements around the park, and the lack of tourists provided the opportunity to engage in intensive classroom work. The guides involved were Damson Chola, Clifford Kandonga, Marle Katinta, and Friday Bwanga, although scouts (Christopher Miselo and Kalasa Kalaba) were included in a shorter programme. The subjects covered correspond to those in the manual: namely Introduction to Guiding, Foundational Concepts, Geography, Birds, Insects, Mammals, First Aid and Driving and Vehicle Maintenance. Over five weeks between 16 Jan and 23 Feb, there were 92 hours of classroom work, which went a long way in consolidating and improving the technical understanding required by the guides.

During this time, the training included eight days camping and working in the field, despite the restrictive influence of the rains.

Leslie recently attended the intensive Luangwa Walking Guides’ course. Unfortunately the Driving Course, which Clifford Kandonga was to attend, was cancelled due to the floods.

3.1.3d MSc Course in Conservation and Tourism

Gryton Kasamu is undertaking the MSc course in Conservation and Tourism at DICE. He is completing his course work and planning his research project in Zambia, on trophy hunting at South Luangwa NP, the results of which will hopefully have implications for hunting in the GMA at KNP.

P Racey and M Stanley will visit Gryton on 27th April to discuss his planned research project, and to encourage him to relate his results to prospective trophy hunting in the GMA at Kasanka. P Racey has applied for a Darwin Fellowship to fund Dolly Chanda’s attendance at the same course.

3.1.4 Resource mapping in Kafinda Game Management Area (KGMA)

During the AGM held by the Chitamba Community Relations Board (CCRB) during 15th – 17th March 2006 it was decided that a resource mapping exercise required the following to be taken into account: the size of GMA, size of population and cartographic information, available natural heritage resources, and land use and management plans for the GMA.

Discussions also took place between Frederick Mbulwe of the Community Relations Board (CRB) and Mike Kennedy regarding the potential for incorporating approaches used in the UK's former Nature Conservancy Council's Phase I habitat survey. However, due primarily to cost constraints, it was decided to use a current ZAWA land use mapping approach.

During the current reporting period reconnaissance trips were made by members of the CRB to sensitise communities in the GMA to resource mapping activities to be undertaken. A CRB meeting was held on 15th and 16th November 2006, involving Village Action Group (VAG) representatives, CRB personnel, ZAWA representatives, and Darwin Research Assistant Lackson Chama (who had been involved in preliminary mapping exercises in his previous position as a Kasanka volunteer during 2005).

The ZAWA approach uses six major land use types (or zones), which can be identified by VAG members within the GMA. These are: (1) Buffer Zone (a zone surrounding the park to enhance its ecological integrity); (2) Cultural Protection Zones (e.g. burial sites, national monuments or heritage sites); (3) Development Zones (areas where settlements, infrastructure such as hospitals or schools, or agriculture etc. may be sited in the future); (4) Sensitive Breeding Zones (e.g. rivers and river confluences); (5) Special Use Zones (where settlements, infrastructure, agriculture etc. already exist); and, (6) Wilderness Zones (primary forest, lakes etc. where no human activity (e.g. fishing) should take place (although this has no legal status)).

Subsequent fieldwork has been undertaken by Kasanka Community Project staff, ZAWA staff and VAG representatives in the GMA. Zone locations were identified and GPS co-ordinates recorded.

A follow-up meeting was held on 19th and 20th March and was attended by the participants of the original meeting and by Mike Kennedy. VAG representatives detailed the zones that they had identified during the field exercise, within their respective areas, and ZAWA staff presented preliminary maps delineating land use zones identified. The maps were distributed and anomalies or omissions were recorded. Mike Kennedy noted that:

(i) Sensitive breeding zones should include seasonal habitats such as temporary wetlands and seasonal river backwaters, which provide a habitat for spawning fish. Annual variability in the extent of these habitats, linked to rainfall patterns, should also be considered. There is also evidence that wetland habitats were more extensive in the past (earth banks, forming fish traps are evident in the park in areas now distant from the nearest water-bodies). This kind of evidence, along with local knowledge, should be used to assess future flood risk in development zones.

(ii) The scope of 'Sensitive Breeding Zones' seemed too limited, and should be termed 'Sensitive Breeding Zones or Habitats'. Rather than focus on areas solely on the basis of breeding, wider habitat requirements (e.g. food, shelter) needed to be covered. There was also a need to consider protecting important habitats generally. For example, the 'Chikanda' group of orchids grow in seasonal wetlands and are harvested and processed as a valuable food source. At the same time, many of these dambos contain springs which form the headwaters of streams and rivers, and therefore need protection. Some large blanket 'Development Zones' indicated on the maps did not appear to cater for the need to consider small areas of important habitat.

(iii) There needs to be consideration as to whether activities in one zone affect conditions in another, and buffer areas should be applied within development zones. For example, fertilizer application in farmed areas should not impact upon Wilderness Zones such as papyrus swamp, either by direct runoff or groundwater contamination.

Those present at the meeting were in general agreement with these observations and agreed that they should be integrated within the plans. Mike Kennedy will be available for future consultation and input into the exercise.

3.1.5 Community Relations and Outreach

Chilli growing, financed in large part by Frederick Mbulwe, Community Relations Coordinator, for supply to local communities to help defend against crop raiding elephants has been ongoing at Kasanka Research Centre (Appendix 10, Fig. 2). Victoria Paterson has been involved with setting up trial chilli fences in local villages which have had their gardens raided, as part of her research work. Some of the materials that are currently used for chilli fences are expensive, and not always locally available. For example Sisal rope, which is used to hang strips of cloth soaked in used engine oil mixed with crushed chillis, and vehicle lubricant grease, which is used to prevent the chilli oil from being washed away by rain: both of these items are expensive and/or difficult to obtain locally. Mike Kennedy has recently suggested trialling beeswax, which may be harvested locally from managed hives, as an oil fixative, and establishing trial Sisal nurseries. These are options that the community project seems keen to pursue.

The involvement of pupils from Kafinda School has also been ongoing. Pot filling and planting took place in July and August 2006. Seeds of native species were sown, alongside seeds of fast growing exotic species (*Eucalyptus* spp and *Pinus* spp), which will provide a source of timber for school buildings (See Appendix 5, Figure 1).

An area of unused waste ground was identified, and planting of *Eucalyptus* trees grown in the nursery took place at Kafinda School in May (Appendix 5, Figures 2 and 3). Mike Kennedy was joined by Frederick Mbulwe (who spoke about the need to conserve native forest cover, and how the trees planted would provide an alternative source of timber from nearby native forest), Leigh Chaloner (Kasanka Education Coordinator) and Vic Paterson. Tree planting at further schools (especially those who have helped with rainfall data collection) is planned for April and May.

Lackson Chama organised a one-day workshop on 15th November for members of the Kafinda School Chongololo (conservation) Club. The workshop activities are shown in Appendix 6. Lackson has also been involved in setting up a Bee-keeping course for members of the local community, which will be held at the Kasanka Research Centre in April.

A number of local students including those waiting for grade 12 results, and those currently sponsored through Kasanka, have been keen to get involved with the Darwin project. Their voluntary help with biomass sample sorting etc. has been greatly appreciated.

Members of the Research Centre community have been keen to help with hourly temperature recording at Mulaushi. Monitoring has continued throughout each night thanks to the watchmen, David, Kingford and Stephen. All those involved have been interested in seeing how average temperatures and minimum and maximum values vary through the year, and are influenced by rainfall. We now have hourly temperature data from the beginning of October 2006 to present (Appendix 3, Figure 13).

3.1.6 Kasanka Research and Conservation Centre

The large meeting room at the Kasanka Research Centre was nearing completion during the visit of P. Racey and M. Stanley in November 2006 (Appendix 10, Fig.1). The roof has now been completed and although windows and doors are still under construction, the building has been painted and used for a land mapping meeting and meetings of the community programme. It will also be used for a beekeeping workshop being organised by Lackson Chama. Leigh Chaloner (Education Assistant – post separately funded by M. Stanley) has designed several colour posters incorporating high quality photographs of the fauna and flora of KNP as well as depictions of basic ecological interactions in the park (with input from M. Kennedy, P. Racey and M. Stanley).

3.1.7 Press and publicity

- Rainfall data from four stations (Wasa, Mulaushi, Kafinda School and Chalilo School) is now being sent to the Zambian National Meteorological Office in Lusaka. The aim is that Kasanka will be promoted as a location on national weather bulletins.

- Mike Kennedy has provided information for an update of the Darwin section of the Kasanka website (www.kasanka.com). He has also written an article detailing the aims of the Darwin project and the research being carried out, for the monthly 'The Lowdown' magazine. The Lowdown has a wide circulation in Lusaka and other major towns in Zambia, and is popular amongst both native Zambians and foreign visitors alike. A copy of the manuscript is provided in Appendix 7.

- Kieran Dodds, a former Aberdeen Zoology student, whose photographic awards were detailed in previous reports wrote an article about Kasanka's bats in BBC Wildlife. A copy of the relevant issue is included in material sent to ECTF.

- Jenny Sharman, a film producer who was responsible for an earlier video of KNP (provided with a previous report) has now produced a DVD (enclosed with materials sent to ECTF) which she has used as a trailer to obtain financial support for a full length documentary about Kasanka's bats and where they come from. She has engaged the services of a TV presenter Charlotte Uehlenbroek. P. Racey will provide the scientific input.

Expeditions

Data collected during the Glasgow University expedition undertaken in August and September 2006 has been collated and analysed and three dissertations written as part of honours degrees. These are awaiting examination and will be included with the final report.

An Aberdeen University expedition ECOZAMBIA2007 will take place June – September 2007, with two main projects:

- a. The effects of bat roosts and fire on Mushito forest structure: this work will compare the Mushito forest in KNP with one at the Mutinondo wilderness area. This will be carried out by James Byng and supervised by Dr. M. Swaine of The School of Biological Sciences, University of Aberdeen.

- b. Behaviour and social interactions of sitatunga: A vegetation map of the Kapabi swamp area of KNP will be produced and the locations and movements of sitatunga across the feeding area and the interactions between individuals and groups of antelope will be spatially plotted. The movements and behaviour will be correlated with the vegetation maps. This work will be carried out by Chloe Denerley and supervised by G. Iason and P. Racey.

An expedition prospectus is included among materials sent to ECTF.

- Conference attendance. C. Soulsby attended a meeting of the European Geosciences Union in Vienna in April 2007 and presented an account of the hydrological work to date at KNP. A copy of his powerpoint presentation is included in the material sent to ECTF. M. Kennedy had planned to return to the UK in time to attend this conference but changed his plans after the landrover accident detailed below in section 7, in order to arrange alternative transport for collecting water samples, while the project vehicle is being repaired.

Timetable for reporting period May-October 2007.

ACTIVITY	MAY	JUNE	JULY	AUG.	SEPT.	OCT.
Hydrological Sampling	Continue	Continue	Continue	Continue	Continue	Continue
Monitoring of experimental plots	Continue	Continue	Continue	Continue	Continue	Continue
Burning of sample plots*	Early Burn	Early Burn	Early Burn		Late Burn	Late Burn
Guide training	Continue	Continue	Continue	Continue	Continue	Continue
Gryton Kasamu completes DICE course	Project work	Project work	Project work	Project work	Course end	
Manuscript for paper on hydrology of KNP	Draft and circulate	Draft and circulate	Draft and circulate/ Submit	Submit		

*Timing of early burn is dependent upon degree of standing water remaining following the end of the rains, and on the presence of combustible dead material. It will therefore vary between years.

3.2 Progress towards project outputs

As detailed in 3.1 excellent progress has been achieved towards the projects outputs and in some cases exceeded such as code 5, papers will only be ready for submission to scientific journals (11b) after the completion of the project. Plans for M. Kennedy to attend a conference this year were postponed because of the landrover accident.

The Kasanka website has taken the place of an electronic newsletter.

3.3 Standard Output Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	TOTAL
Established codes						
2	MSc student being trained	1	-	1		
5	Guides trained	5	6	6		
4 A/C	University Expedition			1	1 planned	
4 C/D	University Expedition			8 weeks	10 weeks	
7	Video produced	1	-	1 (DVD)		
8	Weeks of residence by postdoctoral scientist	-	30	46		
8	Weeks of visits by AU, MLURI, & HHT personnel	4	7	4		
11A	Annual Workshop	1	1	1		
15A	Press release	1	1	1		
16A	Electronic Newsletter	-	1	1		
23	Donation from Holly Hill Trust	1	1	1		

Research at KNP is ongoing and publication at this stage is premature

3.4 Progress towards the project purpose and outcomes

As our report reveals, we are on track to delivering our project purposes, the most important of which is a hydrological and fire management plan. Other project purposes, such as training local people to build their capacity for environmental education and enhancing the capacity of KNP to attract tourists, have largely been met.

3.5 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

It is probably too early to report on a positive impact on biodiversity as a result of this project

4. Monitoring, evaluation and lessons

- M. Kennedy provides monthly reports to P. Racey, C. Soulsby and G. Iason.
- E. Farmer provides quarterly reports to KNP which are circulated to G.Iason, P.Racey, C.Soulsby and M. Stanley.
- The annual stakeholders workshop at KNP provides an excellent opportunity for the main project partners to review progress.
- Quarterly meetings are held in Aberdeen between P. Racey, C. Soulsby and G. Iason (attended by M. Kennedy when in UK)

5. Actions taken in response to previous reviews (if applicable)

The review of last years report was very positive. However the reviewer requested that it would be helpful to have an explanation of the co-funding to enable an appreciation of what the HHT covered and what the DI covered. Although it was planned to debit both the DEFRA grant and the HHT grant from the inception of the project (as detailed in section 29, Table B, Salary costs in the original proposal), in practice, because it became apparent that the project would have a longer lifetime than three years, and because of the imperative of spending all DEFRA money within a financial year, in practice the project has been funded for the first three years mainly by DEFRA. A donation of £25kpa from HHT has been largely unspent and will be used to fund the final year of the project.

6. Other comments on progress not covered elsewhere

Significant difficulties encountered during the year:

•Project vehicle

During a sampling trip which involved travelling on the main metal road outside the park, the vehicle, which was driven by Lackson Chama, started to wobble, left the road, and rolled down a steep embankment. Mike Kennedy and Lackson Chama who were seated in the front with seat belts fixed were unhurt but Mishek Malata, a student volunteer from a local village, sustained a closed fracture to his humerus. He was taken to the orthopaedic hospital in Lusaka where the broken bone was pinned and is healing satisfactorily. The wobble which caused the crash is a syndrome familiar to some landrover drivers including two of the authors of this report (but not to another)! The insurance company has assessed the damage and agreed payment and the vehicle is being taken to the specialist landrover garage (Foley's) in Livingstone. The loss of a project vehicle for an indeterminate period is inconvenient but steps are being taken to borrow or hire replacement vehicles while the project vehicle is being repaired.

• Email

When the project started, email contact was via a radio link (Bushmail) and the maximum transmission was four pages with no attachments. The installation of a satellite link at Wasa lodge KNP (VSAT) was a major step forward in the ease of communication. Attempts were made to extend this link to the Kasanka Research Centre at Mulaushi but so far without success. However during the preparation of this report not only did the VSAT develop a fault but so did the server. The fact that this report incorporates a great deal of new information from the research project at KNP shows that it has been possible to work round this problem, due largely to the fact that Edmund Farmer flies frequently to Lusaka from where he can access the internet.

Does the project face any particular risks?:

• One of the original purpose of the project was " To enhance the capacity of KNP to attract tourists and thereby achieve financial self-sustainability". The former is achieved, as indicated by high bed-occupancy rates. but the latter is threatened by factors outside KNP's control, notably inflation of fuel prices which drives general inflation and a government edict that the wages of all workers (except those in the public sector) should be doubled.

Because the goal of financial self-sustainability has appeared to recede, the UK partner (and long-term donor of KNP), HHT has commissioned an external review of possible future scenarios for KNP by John Hanks, of Conservation Services International, who has wide experience of national parks in Africa. That review will take place in June 2007.

• There is considerable concern by KTL that the National Government has designated a large block of land immediately upstream of KNP, mainly along the Luwombwa river, for agricultural and associated

industry. This is one of a group of new blocks (one in each Province of Zambia) established by the President's office. Work is already underway to upgrade road access, bring in mains electricity, and demarcate land plots. Most alarming of all is that the plan includes around 9 dams on both the Luwombwa itself and also most of the tributaries in the block. This could obviously have a dramatic impact on the natural hydrology of the Park, especially the Western half. Whilst there have been moves towards an EIA, including a scoping exercise and KTL has contributed as far as possible in these, there has not yet been a full EIA as required by law. However this does not seem to be slowing work and it is said that work is starting on a major dam on the Luwombwa already, but without an EIA. When asked why, the local officials say they are obeying orders from the "very top" to proceed with the development whatever. Earlier on there was talk that a Libyan group were going to take up a lot of land, but they have apparently lost interest and now Chinese investors seem to be involved. The local people living in the designated area are very unhappy at the prospect of their traditional land being re-classified for commercial agriculture and there has been some confrontation. Whilst it is unclear to KTL whether the project will succeed, it seems to be going ahead with or without any EIA, on presidential orders and this is of considerable concern to the ecology and hydrology of KNP.

7. Sustainability

The project has a high profile within the conservation community of the country, not least because KNP is often used as a staging post by staff of National Parks further north who are travelling to Lusaka and meet project staff during their stay.

The Article in Lowdown, a magazine that is widely available and read throughout Zambia will also contribute to the in-country profile, as have articles in the "Black Lechwe" magazine of the Wildlife and Environmental Conservation Society of Zambia and the Munawanga Zoo Trust newsletter

The project also has a very high profile locally and there is no shortage of volunteers.

So far as the main scientific strand of the project is concerned our aim is not to exit in a year's time but to maintain the study and the grant application to the Leverhulme Trust is being prepared. A project entitled "Capacity building for sustainable biodiversity management in Zambia" has been submitted to the British Councils DELPHE Initiative and the results are awaited. If successful this project will be focussed on KNP and its GMA and will help to sustain the impacts of the present DI project.

The sustainability of the project will be further assured if

- (i) Dolly Chanda is successful in obtaining a Darwin Fellowship
- (ii) Gryton Kasamu returns to his post of Acting Area Warden for ZAWA

8. Dissemination

C.Soulsby gave a powerpoint presentation to the European Geosciences Union on the hydroecological work (included in materials sent to ECTF)

M. Kennedy lectures schoolchildren as part of the Education Programme organised by Leigh Chaloner.

9. Project Expenditure

Please expand and complete Table 2.

Table 2 Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)

Item	Budget (please indicate which document you refer to if other than your project schedule)	Expenditure	Balance

Highlight any agreed changes to the budget and explain any variation in expenditure where this is +/- 10% of the budget.

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2006/2007

Project summary	Measurable Indicators	Progress and Achievements April 2006-Mar 2007	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <p>The conservation of biological diversity,</p> <p>The sustainable use of its components, and</p> <p>The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</p>			
<p>Purpose</p> <p>To build capacity to conserve biodiversity of KNP by developing hydrological and fire management plan for sensitive ecosystems.</p> <p>To uplift management of KGMA resources.</p> <p>To improve conservation education.</p> <p>To alleviate poverty.</p>	<p>New knowledge of hydrological relations between rivers, lakes, swamps and grassland in KNP. New knowledge of distribution and behaviour of a large grazer (sitatunga) in relation to habitat.</p> <p>Cross sectoral cooperation in the planning of KGMA resource utilisation.</p> <p>Improved conservation experience for visitors.</p>	<p>Water sampling and vegetation sampling ongoing in KNP and Kafinda GMA. Input made into Kafinda GMA resource mapping exercise.</p> <p>Continuation and expansion of involvement and education of park staff and local communities (including school children) in DI project.</p> <p>Wider promotion of project amongst tourists and other Zambian institutes.</p>	<p>CONTINUATION OF SAMPLING.</p> <p>CONTINUATION OF INPUT INTO RESOURCE MAPPING EXERCISE.</p>
<p>Outputs</p>			
<p>Production of fire management plan and manual</p>	<p>Data generation from baseline monitoring of waterbodies and experimental plots.</p>	<p>Baseline data collection ongoing. Sampling protocol supplied to Darwin.</p>	<p>Expansion of rainfall monitoring activities to include sites outside of KNP but within KGMA</p>
<p>Protection of water levels and hydrological flow pathways in key wetland habitats.</p>	<p>Data generation from baseline monitoring.</p>	<p>Data collection and collation ongoing.</p>	<p>Maintain monitoring and undertake detailed analysis of data.</p>
<p>Two Zambian staff trained in tourism and conservation at DICE.</p>	<p>Second candidate, Gryton Kasamu, identified for training and commenced course in September 2006</p> <p>Dolly Chanda accepted by DICE pending</p>	<p>Gryton Kasamu currently at DICE; application made for Dolly Chanda for Darwin Fellowship to attend DICE from September 2007.</p> <p>Completed MSc thesis (Patricia Mupeta)</p>	<p>Application preparation for masters funding for Lackson Chama.</p>

	funds being secured.	supplied to ECTF.	
Local staff trained as environmental educators and guides	Training work by Leslie Reynolds ongoing. Field based training and examination of trainees undertaken; further training ongoing.	Ongoing development of guide training manuals.	Selection and training of remaining staff
Resource database for KGMA.	Training of local survey staff in monitoring techniques and production of resource map. Generation of maps detailing land use zones within Kafinda GMA	Community sensitisation and Village Action Group (VAG) representative involvement in identification of land use zones Direct ZAWA involvement in mapping exercise. Involvement of Mike Kennedy in ongoing workshops.	Development and finalisation of techniques for mapping and staff training. Continued involvement of Mike Kennedy in overall exercise
Direct Involvement with local communities	Input by Darwin staff into workshops and other activities	Course co-run with Kasanka Education and Community projects for conservation club teachers. Conservation and natural resource management activity workshops held at Kasanka Research Centre.	Work to be continued and further activities to be identified where appropriate.

Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.

Supplementary material (Mailed to ECTF)

1. Draft guiding manual produced by Leslie Reynolds
2. DVD “ Festival of the Flying Fox” produced by Jenny Sharman as trailer for planned documentary
3. BBC Wildlife March 2007
4. Draft DELPHE proposal
5. ECOZAMBIA 2007: Aberdeen University Expedition proposal
6. Powerpoint presentation “ Ecohydrological Approaches etc” given at European GeoSciences Union , Vienna, April 2007 by C.Soulsby.

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2006/2007

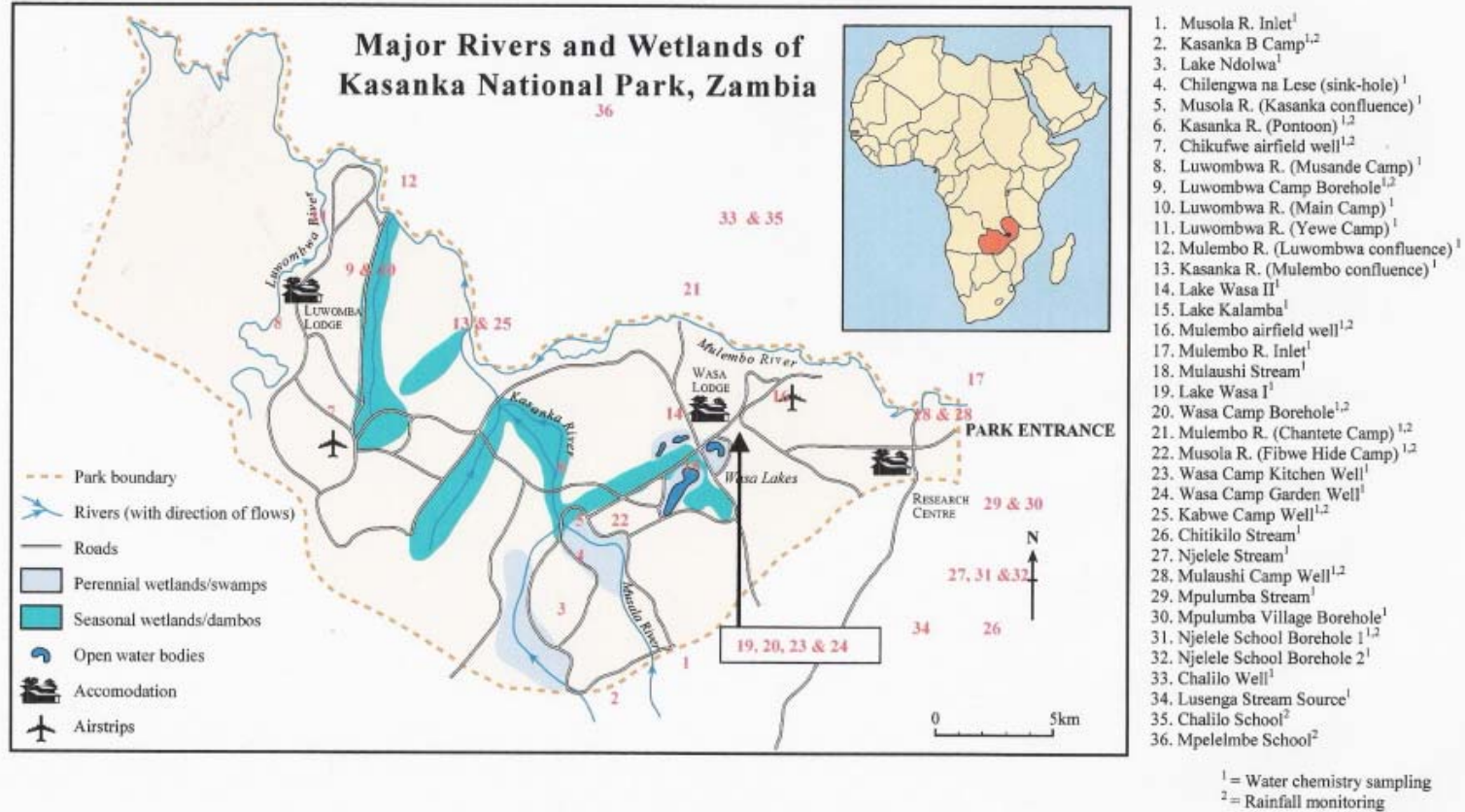
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Appendix 2

Map showing approximate sampling locations in and around Kasanka



Appendix 3

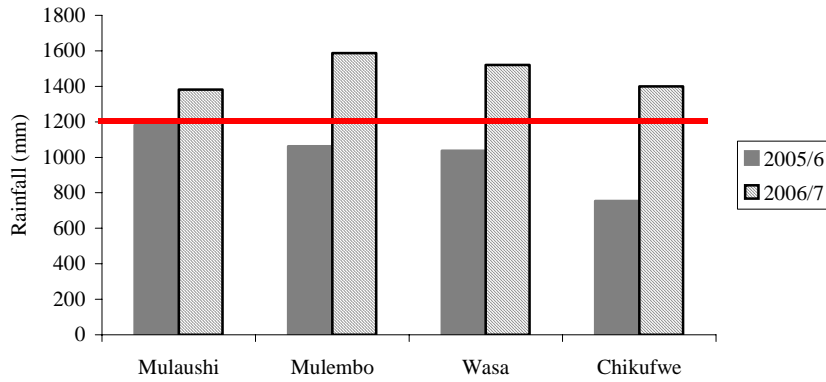


Figure 1 Rainfall at four gauged sites across Kasanka (running E-W, Mulaushi-Chikufwe). Red line indicates regional average (1200mm). 2005/6 figures are final totals to 22nd May 2006; 2006/7 figures are totals to 28th March 2007.

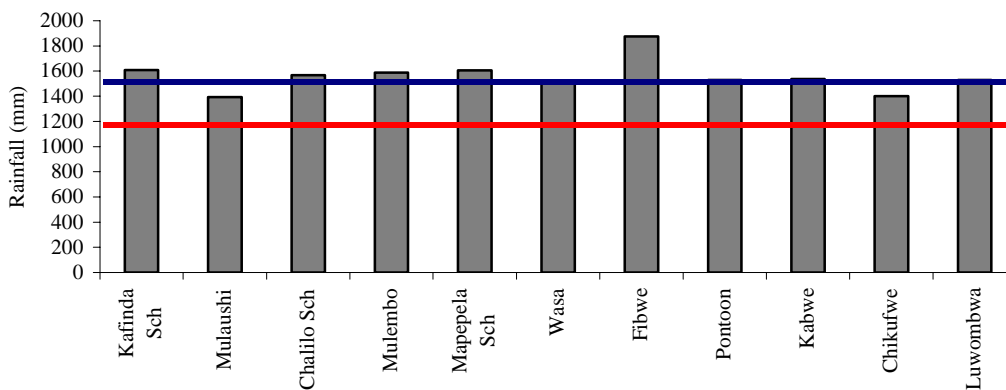


Figure 2 Rainfall totals for all sites continually monitored during 2006/07 wet season. Red line indicates regional rainfall average (1200mm); blue line indicates average for 2006/07 season as at 28th March 2007 (1560mm).

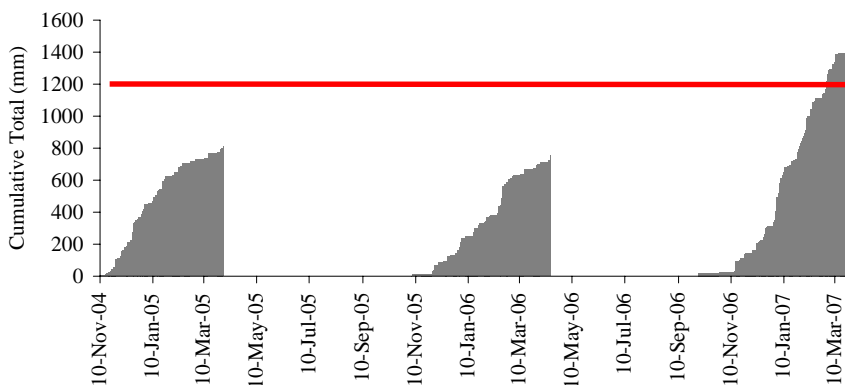


Figure 3 Cumulative rainfall totals for Chikufwe airfield 2004 to 2007. Red line indicates regional average (1200mm)

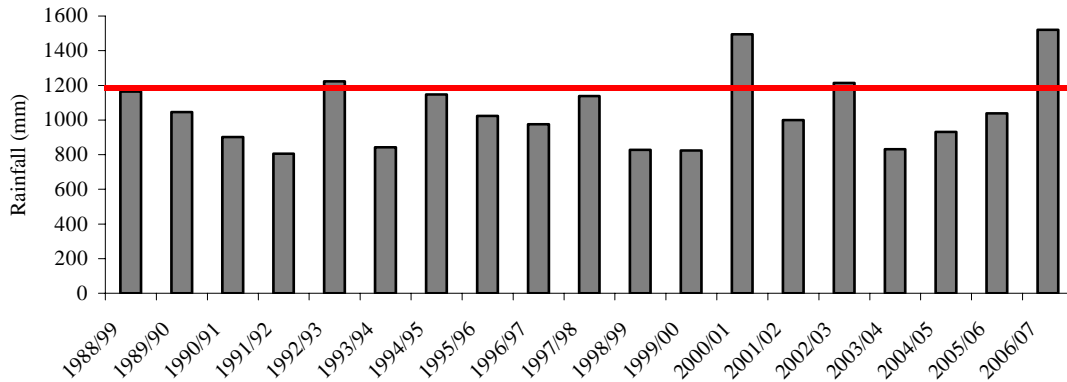


Figure 4 Yearly total rainfall figures for Wasa camp, 1988 to 2007. Red line indicates regional average (1200mm).

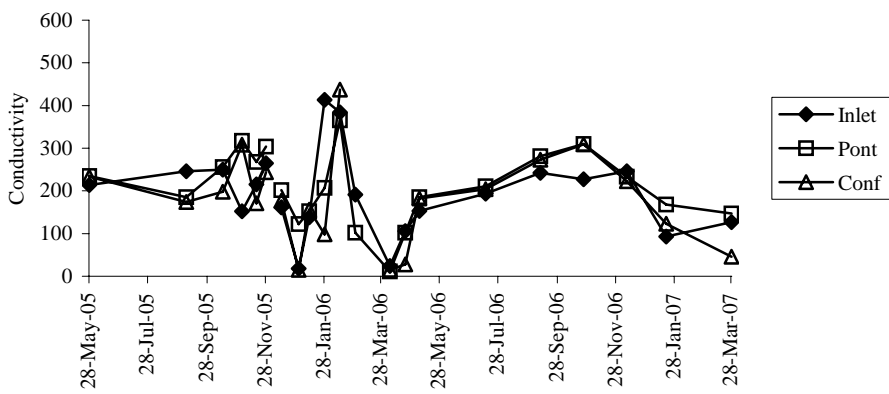


Figure 5 Conductivity (µS) values for Kasanka River. Kasanka B (Inlet), Pontoon (Pont) and confluence with Musola (Conf) sample sites run downstream.

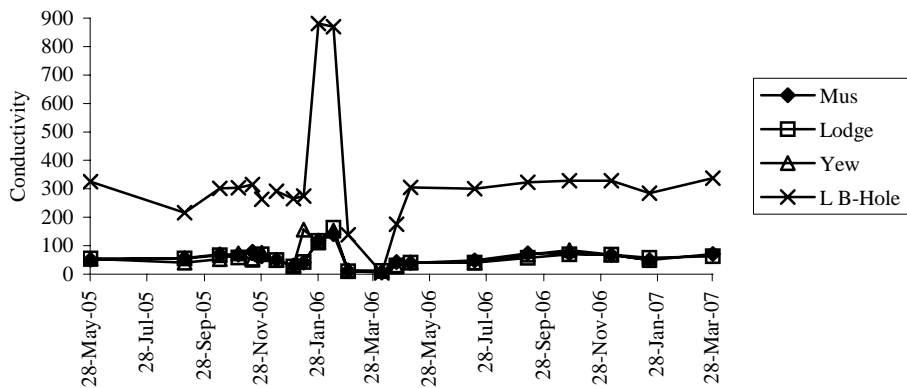


Figure 6 Conductivity (µS) values for Luwombwa River and Camp borehole. Musande Camp (Mus), Luwombwa Lodge (Lodge) and Yewe Camp (Yew) sample sites run downstream.

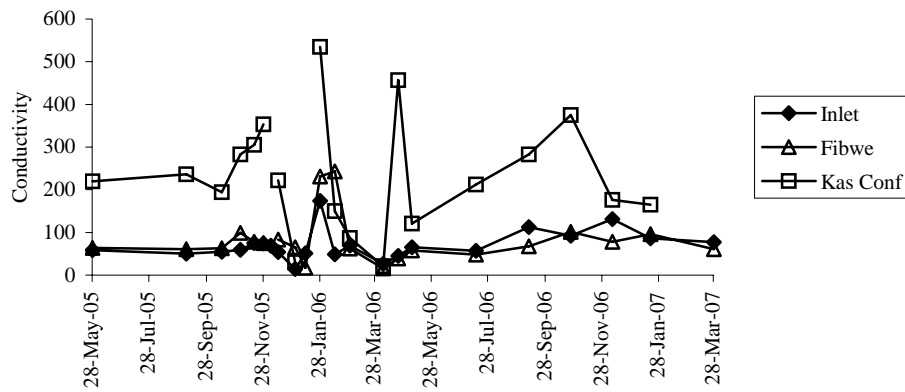


Figure 7 Conductivity (μS) values for Musola stream. Inlet to park (Inlet), Fibwe Hide (Fibwe) and confluence with Kasanka River (Kas Conf) sites run downstream.

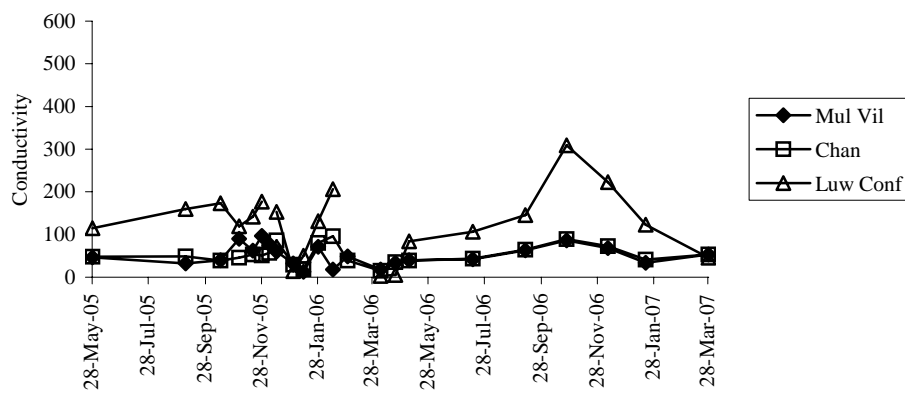


Figure 8 Conductivity (μS) values for Mulembo River. Mulembo Village (Mul Vil), Chantete Camp (Chan) and confluence with Luwombwa River (Luw Conf) sample sites run downstream.

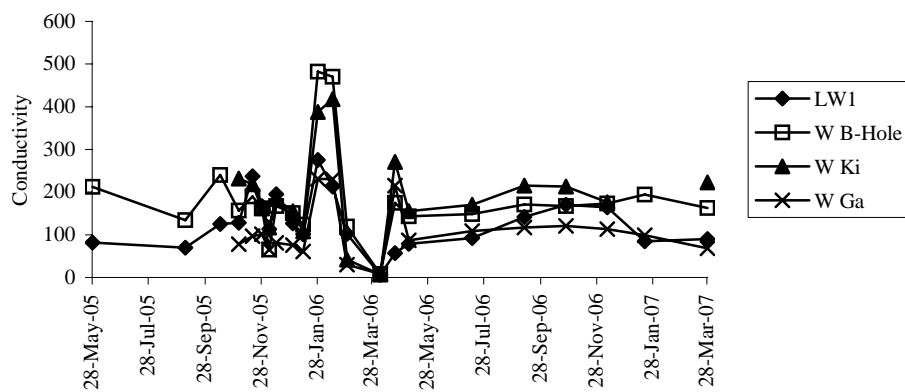


Figure 9 Conductivity (μS) values for Wasa Camp area. LW1 = Lake Wasa I; W B-Hole = Wasa Camp Borehole; W Ki = Wasa Camp Kitchen Well; W Ga = Wasa Camp Garden Well.

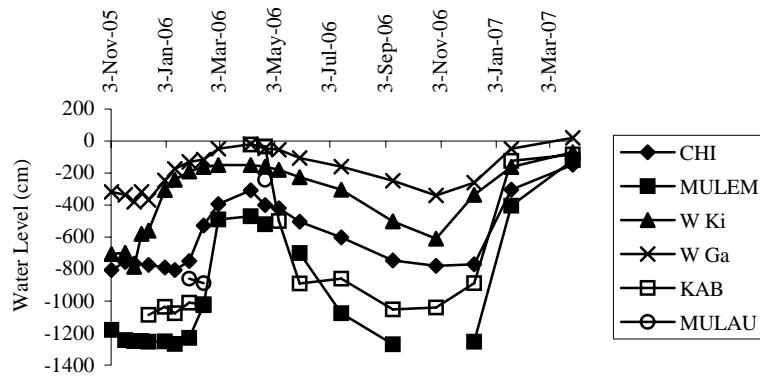


Figure 10 Water depth (cm) relative to surface datums for wells. CHI = Chicufwe air field; MULEM = Mulembo air field; W Ki = Wasa camp, Kitchen well; W Ga = Wasa camp, Garden well; KAB = Kabwe camp; MULAU = Mulaushi (Kasanka Research Centre).



Figure 11 A typical termitaria grassland plot at Lake Kalamba towards the end of the dry season. The plot has a high fuel load, producing a faster and more intense burn than for the nearby early burn plot.

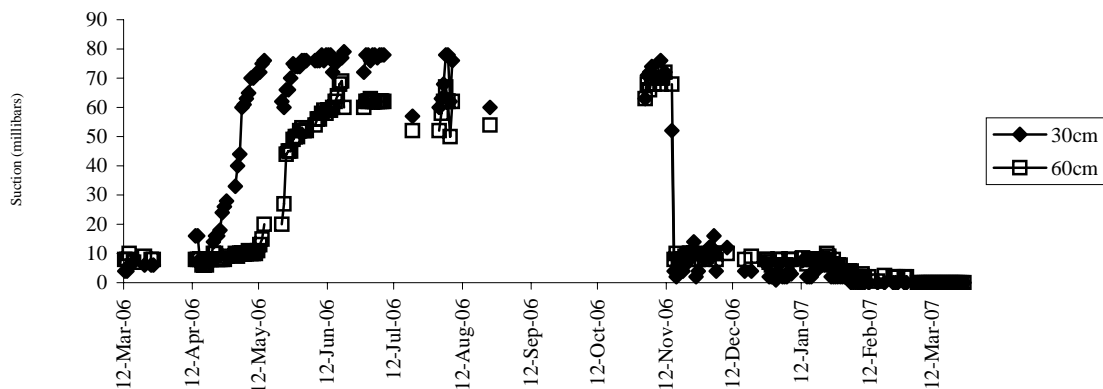


Figure 12 Tensiometer readings at Wasa camp (millibars suction) at soil depths of 30cm and 60cm. Recordings were not possible after mid August 2006 due to rapid drying out of equipment, indicating extremely dry soils to a depth of at least 60cm.

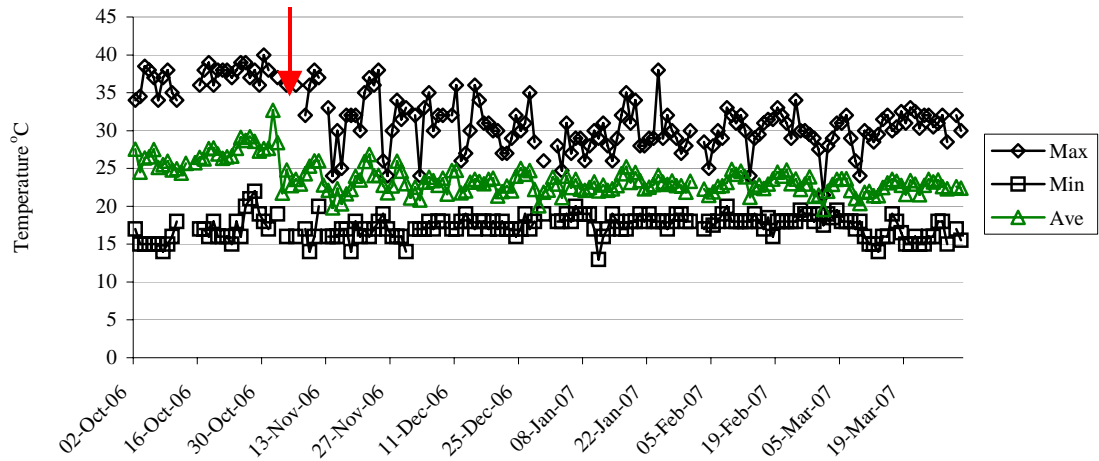


Figure 13 Daily minimum, maximum and average temperatures for Kasanka Research Centre, based on hourly recordings. Red arrow indicates beginning of sustained rainfall (i.e. 14mm fell on 3rd October, and 0.5mm on 27th October, but rainfall which was sustained for several days did not occur until 12th November).

Appendix 4



Conservation of Wetlands and Associated Biodiversity in Northern Zambia

Minutes of the Annual Stakeholder workshop held at Kasanka National Park
30th November 2000

Present:

Name	Position	Organisation	
Martin Stanley	Trustee	Holly Hill Trust	Chair
Dr. Mike Kennedy	Darwin Researcher	Aberdeen Univ./KTL	Secretary
Manjata Manjata	Vice chairperson	Chitambo C.R.B	
Andrew Mukupa	Park Ranger	ZAWA	
Victoria Paterson	Student researcher	Glasgow University	
Milton S. Sakala	Council secretary	Serenje District Council	
Dolly Chanda	Comm. Rel. Officer	KTL	
Frederick C. Mbulwe	Comm. Rel. Co-ord.	KTL	
Derick Chalwe	Councillor	Serenje District Council	
Edmund Farmer	Park Manager	Kasanka Trust	
David Lloyd	Acting Chairman	Kasanka Trust	
Prof. Paul Racey	Professor	Aberdeen University	
John Hudson	Trustee	Kasanka Trust	
Leslie Reynolds	Guide Trainer	KTL	
Clifford Kadunga	Guide	KTL	
Kim Farmer	Projects co-ordinator	KTL	

Apologies:

Director-General ZAWA

Director of research, ZAWA

Hon. Chief Chitambo IV

H. Sambiana, Park Ranger, ZAWA

Lackson Chama, Darwin Research Assistant, KTL (who had malaria)

Leigh Chaloner, Education Officer, KTL (due to a family bereavement)

Martin Stanley (MS), Trustee of the Holly Hill Trust, (Co-sponsors of the project) was asked to chair the meeting, and called the meeting to order at 14:25.

The Chair, Martin Stanley	Called for introductions from those present at the meeting. He then reminded the meeting of the purposes of the Darwin Project to support research, training and conservation in Kasanka national park and beyond, and that there had been an annual
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	<p>stakeholders workshop held a year previously. The project was now fully under way and he called on Prof Racey, the project leader to review progress.</p>
Prof Racey	<p>Explained that the Darwin initiative was established by the British Government 13 years ago to comply with its obligations towards protection of biodiversity following the Rio Convention on Biodiversity held in 1992. The Initiative aims to assist countries rich in biodiversity but poor in finance with institutional capacity, applied research and training. The intention of the programme is to achieve this through providing expert knowledge from the UK to help train local people in appropriate skills. PR summarised progress since the last workshop:</p> <p>Community Development The project had agreed to allocate \$1500 per annum directly towards community development in the Chitambo Chieftaincy. In 2005 this was used towards the renovation of the forestry department house in Chalilo. This is now complete</p> <p>Sponsorship to Masters Degree Gryton Kasamu was the second candidate identified to undertake the Masters degree in Tourism and Conservation at DICE. His nomination came from ZAWA following the 2005 Stakeholders Workshop. Gryton arrived at DICE in September 2006 to begin his studies.</p>
	<p>Additional Activities It was reported that both of the UK based co-investigators on the project, Professor Chris Soulsby and Dr. Glenn Iason, had applied for further funding to undertake research at Kasanka independent of the Darwin Project, but complementary to it. However, Prof. Soulsbys' application to the Ralph Brown expedition award was unsuccessful, as was Dr. Iasons' application to National Geographic.</p>
E. Farmer	<p>Spoke about how the Darwin project had to come to Kasanka following contact between KTL and Prof. Racey in Aberdeen. Visits by Prof. Racey, Prof. Soulsby and Dr. Iason to the park had lead to the identification of habitats in critical need of research within the park, and the formulation of research ideas. EF reported that much of the building work at the Kasanka Research Centre (KRC) was now completed, and that the interpretation centre should be finished in the next six months.</p>
Leslie Reynolds	<p>Gave a paper providing an update on Guide training activities in Kasanka, and on the production of educational materials. A copy of the paper is provided in Appendix A</p>
Dr. Kennedy	<p>Spoke about the variety and importance of wetland habitats within Kasanka National park, and the need for research on these habitats</p>

	<p>to aid their management. The two main research areas of hydrological sampling and burning/grazing interaction experiments, and the connections between these two areas were discussed. Some initial results and tentative conclusions from the hydrological sampling so far were presented.</p> <p>The work of the project with local communities was mentioned and Dr. Kennedy commended Lackson Chama his active role in engaging children from the Local Kafinda School in helping establish a tree nursery at KRC. The importance of building on links with the community and education projects was also highlighted.</p> <p>The report presented by Dr. Kennedy is provided in Appendix B.</p>
The Chair	<p>Asked if Dr. Kennedy could update the workshop on community-based activities in the absence of Lackson Chama.</p>
Dr. Kennedy	<p>Responded that Mr Frederick Mbulwe had agreed to cover this topic in his report to come later.</p>
The Chair	<p>Explained that Leigh Chaloner was unable to attend the meeting due to unforeseen circumstances, and that Kim Farmer would report on her behalf.</p>
K. Farmer	<p>Gave detailed reports on the education project activities. She talked of a successful link being established between a school in the Netherlands and Chalilo School.</p> <p>Leigh had identified that working with local women has good conservation potential and wishes to pursue this course more in the future.</p> <p>Leigh had been involved in running a conservation education workshop aimed at teachers within the Chitambo Chiefdom who run Chongololo clubs. The meeting also involved members of the Community and Darwin projects.</p> <p>Fundraising has so far provided funding for six students to attend secondary school in 2006.</p> <p>A new community school has begun building at Mulembo village, and a pre-school has been successfully held at the KRC while initial building is completed. Mulaushi village has also asked for help in establishing a community school, and this is seen as a positive step as there is a strong history of poaching by village members in the park.</p> <p>KF reported that various applications for funding for the education project are currently in place.</p>
F. Mbulwe	<p>Spoke about joint projects involving the Community project and the Darwin project, including conservation education in local</p>

	<p>schools and school visits to KRC for environmental activities. He also spoke of the Community project and its commitment to involving ex-poachers and people displaced from the park at its inception in visits to the park and spreading conservation messages.</p> <p>He also spoke about the Darwin project involvement in the Chongololo workshop, and possible future involvement in resource mapping activities. He said that local communities in the Game Management Area (GMA) needed to be involved in the formulation of a land use management plan in order for the GMA to support the growing population. This could also involve input of Darwin expertise following further discussions. He commented that initial activities (community workshops) had helped to identify fragile and or 'special' habitats in the GMA that need protection, along with parcels of land which had been identified for human use such as building and agriculture. He commented that the rainfall data being collected in the GMA as a part of the Darwin project could help to inform such decisions.</p>
D. Chanda	<p>Spoke about land use plan/ resource inventory activities being lead by the community project, and said that these have included a socio-economic and a resource inventory component. The socio-economic component involves analysis of livelihood strategies and development plans. The inventory component, it has been decided, needs a much higher level of funding than was initially envisaged, and ZAWA have been consulted about this. In the meantime reconnaissance work has begun to identify areas in the GMA containing flora and fauna needing protection and potential parcels of land for direct human use. All involved have generally seen this initial process of sensitisation as positive. Representatives for Village Action Groups (VAG's) were also elected during the process.</p>
The Chair	<p>Opened the floor to general discussion He asked if there were any indicators of agreement of use of land in the GMA</p>
F. Mbulwe	<p>Responded that the idea of introducing a buffer zone around the park had been part of the process, and that he was surprised that it had been generally accepted.</p> <p>Another idea that had been discussed in the process was that zonation of land in the GMA should include certain parcels for the conservation of wildlife, and certain freshwater habitats that that will not be subjected to the use of poisoning. This will be monitored from within the communities, who have given their commitment to protecting their own resources.</p> <p>He also accepted that the current practice of harvesting caterpillars by cutting trees was not good and needed to be worked on with the communities. He mentioned that some areas for human settlement had also been identified.</p>

The Chair	Said that that he receives park reports, and that levels of poaching, the finding of illegal canoes on rivers and the number of snares being collected etc. don't seem to be reducing, and asked FM if he thought they were likely to?
F. Mbulwe	Said that people coming across from the Democratic Republic of Congo (DRC) were still a problem, as were people from very remote areas surrounding the park. One positive development was coming from visiting the remote villages and allowing them to become involved in conservation activities. However, certain villages still contained what were considered to be hardened criminals, and this was a bigger problem which needed working on.
E. Farmer	Disagreed with FM and said there was little influence from people from the DRC or from villages outside the GMA. He said that there were still big problems from villages such as Mapepela and Chalilo, where the community project had long been active. He said that the hardened core of criminals in this area was the problem, and these aren't the kind of people that will listen to the community project. He said this wasn't a failing of the community project as these kinds of people occur in most countries of the world in some form.
The Chair	Said that the Community project and local communities, through the Community Resource Board (CRB), gets a flat amount of money from park income. He asked if there were any alternatives to this process.
E. Farmer	Replied that communities need to see visible benefits from the income that is derived from the park, and that this income then needs to be taken away from a community if poaching within that community continues to be a problem.
F. Mbulwe	Said that the Community project didn't have a history of visiting remote areas surrounding the park, and that this needs to be, and is now being addressed so that they can contact and work with these communities.
A. Mukupa	Said that the formation of a land use plan is a positive step forward, and that if areas such as villages are clearly designated then this should aid the monitoring of potential poachers.
The Chair	Asked if the community project staff could talk about the role of community scouts.
D. Chanda	Replied that the CRB employed six village scouts, and that there were also three volunteers. She continued that funding for the six village scouts had ended but that the CRB will use income from the hunting outfit operating in the GMA to re-employ the scouts, and that they will work alongside ZAWA officers in the GMA.

A. Mukupa	Commented that protection needs to begin outside of the park and that more village scouts are needed. He said that there needs to be confidentiality in the location of scout camps in order to deter potential poachers. He also mentioned that there are similar schemes in areas such as Banguelu GMA.
The Chair	Asked Dr. Kennedy of future plans for the research component of the Darwin project.
Dr. Kennedy	Responded that the hydrological and experimental work programmes would continue, and that the project should have ongoing and continued inputs into activities such as the resource inventory programme and the education programme. He said that research from outside of the park that was complementary to the project aims, for example in the form of a proposed expedition from the University of Aberdeen, would continue to be encouraged. He also said that there would be a search for further funding to continue with aspects of the project in future.
Prof. Racey	Mentioned that there was a bid currently being put together to be submitted for funding under the British Council DELPHE programme. Dr. Kevin Murphy from the University of Glasgow was fronting this.
E. Farmer	Said that guide training was to continue.
L. Reynolds	Said that he should have a draft of the guide-training manual produced by March 2007.
K Farmer	Said that the training of people on a basic level outside of the park to aid conservation education in schools etc. was also needed.
The Chair	Asked Victoria Paterson to talk about her research work.
V. Paterson	Said that she was undertaking her M.Sci. degree at Glasgow University, and that this required a work placement for up to ten months. She said that she was helping out with the research work for the Darwin project, and would be carrying out her own project looking at chilli peppers as a defence against crop raiding by elephants in the GMA. She said that a chilli fence had been installed at nearby Anowell village and had so far been successful. She said that she was also getting involved in key conservation activities in and around the park, and that she thought that the recent visits by school groups to the park had been very positive and that the children gained a lot in terms of understanding why the resources in the park should be conserved.
E. Farmer	Said he thought that it was very positive that the research, community and education activities at KRC were so well integrated.

Dr. Kennedy	Commented that it was also a positive thing that local school children were becoming involved in conservation and environmental activities based at KRC, and that he felt they enjoyed and appreciated being involved and were learning from the experience.
The Chair	Asked if anyone had any further points to they wished to raise.
Prof. Racey	Asked if people could go and think about what their priorities were for the future in order to try and target potential funding opportunities. PR also mentioned that there would be an opportunity for anyone involved in the workshop to visit the mushito forest to see the evening flight of the Straw coloured fruit bats that evening.

Appendix 5



Figure 1 Pupils (and Chongololo Club members) of Kafinda school with filled tree planters at Kasanka Research Centre, July 2006.



Figure 2 Pupils involved in tree planting at Kafinda School, National Youth Day, 12th March 2007.



Figure 3 Tree planters at Kafinda School, 12th March 2007.

Appendix 6

PROGRAMME FOR THE CHONGOLOLO CLUB WORKSHOP HELD AT KASANKA RESEARCH CENTRE, November 11th 2006.

Time	Activity	Facilitator
08:45 – 09:30	1. Clearing and Watering at the Tree Nursery	Mr. L. Chama & Mr. F.C. Mbulwe
09: 45 – 11:00	2. Mushroom ecology and growth	Mr. F.C. Mbulwe
11:00 – 11:30	Tea Break	Marjory & Mr. Boas
11:30 – 12:30	3. Waste disposal/ Recycling & Environmental Management	Miss Victoria Paterson
12:30 – 14:00	Lunch	Marjory & Mr. Boas
14:05 – 15:30	Conservation Video Show	Mr. L. Chama, Mr. F.C. Mbulwe and Miss V. Paterson
15:05 – 15:30	Propagation of wild fruit trees – Focussing on the December 15 th 2007 National Tree Planting Day	Mr. L. Chama
15:30 – 16:30	Conservation & Tourism Development: Focussing towards local community development	Miss Leigh Chaloner/ Mr. Lackson Chama
17:00	Closing Remarks	Mr. F.C. Mbulwe



Darwin Initiative: biodiversity and water research in and around Kasanka National Park (Article submitted to 'The Lowdown')

People passing by the main entrance of the Kasanka National Park (KNP) in Serenje District may have noticed groups of people drawing buckets of water, taking samples, and using various pieces of equipment. These people were monitoring the water quality of rivers running into Kasanka as part of a project based at the new Kasanka Research Centre on the edge of the park. The project, entitled 'Conservation of Wetlands and Associated Biodiversity in Northern Zambia' is funded under the UK government Darwin Initiative programme, aimed at conserving biodiversity and increasing awareness of conservation issues through research and education in countries rich in biodiversity, but poor in finances. The initiative came into being following the Earth Summit held in Rio de Janeiro, Brazil, in 1992, and this Darwin project is the first to be based in Zambia. The UK based Holly Hill trust provides additional funding and the project is administered through the University of Aberdeen in the UK.

The issue of climate change is of increasing concern to governments and environmental policy makers worldwide. In tropical, high rainfall areas such as Northern Zambia, the threat of reduced rainfall in the future is one of the major concerns. The use of fire as a management tool in and around National Parks in these areas during the dry season is also common, but the impacts are not fully understood and more research is needed to investigate specific impacts on different habitat types.

At Kasanka, despite flooding of grasslands during the rains, and the presence of rivers that never dry, some of the distinctive habitats in the park may be vulnerable to drying out and their distinctive biodiversity threatened. Papyrus swamp is one of the most important habitat types found in Kasanka, with Fibwe and Kapabi areas home to arguably the world's most visible population of the rare semi-aquatic Sitatunga antelope (*Tragelaphus spekeii*). What is thought to be the world's largest seasonal congregation of straw coloured fruit bats (*Eidolon helvum*) roost seasonally in the nearby wet evergreen mushitu forest. This is a woodland type dominated by species such as the African Mahogany (*Khaya nyasica*), and forms a distinctive high canopy above the surrounding miombo woodland. High densities of the globally uncommon Puku antelope (*Kobus vardonii*) can also be found grazing at the boundary between the miombo forest, and the seasonally flooded wetland areas known as dambos.

These important wetland habitats are potentially vulnerable to drying out through changes in rainfall patterns, and through inappropriate use or timing of management practices such as burning. Research being undertaken by the Darwin aims to help secure the future of Kasanka's distinctive biodiversity through the conservation of these sensitive habitats.

The project is also working with local communities in the Kafinda Game Management Area which surrounds Kasanka. Activities include the collection of rainfall data at local schools, monitoring of water quality of rivers flowing into the park from the GMA, and the promotion of environmental education.

Water quality monitoring covers a variety of Lakes, rivers and seasonally inundated dambos, plus a number of wells and boreholes in the park and on its boundaries. Controlled burning

experiments are also being carried out in areas of miombo woodland, in termite-dominated grasslands surrounding dambos, and in areas of seasonally flooded grassland. The experiments are comparing the effects of early burning following the end of the wet season, late burning just before the onset of the rainy season, and absence of burning.

Understanding the hydrological processes underpinning the maintenance the wetland habitats is a prerequisite to their conservation and the protection of the important species that utilise them. We have used environmental tracers as tools in identifying the important hydrological connections between the wetlands and their surrounding catchments. Hydrochemical sampling has been ongoing at 30 sites within the Park and on it boundaries since May 2005 in an attempt to ascertain the seasonal patterns of water movement that sustains these important freshwater systems. Stable isotopes of oxygen have been used, along with geochemical tracers (electrical conductivity and alkalinity) to identify the main sources of water sustaining these wetlands.

We eventually hope to be able to provide a fire and hydrology management plan for the park. Such a publication may also be of use to other parks and protected areas throughout Zambia and neighbouring countries with similar habitats.

The Kasanka Research Centre is open for the use of students and researchers from Zambia or further afield who wish to undertake work in the park or the surrounding areas. Further information about the Darwin project can be found on the Kasanka website (www.kasanka.com), and about the Darwin Initiative in general on www.darwin.gov.uk. Further details are also available from the Darwin office at the Kasanka Research Centre.

Dr. Mike Kennedy

Appendix 8

The distribution of puku in
Kasanka National Park

Pauline Smit
Janneke Steens

Internees from
University of Professional Education
HAS Den Bosch
The Netherlands

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 - 3.2. RESEARCH PLAN
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5.

1. Introduction

This chapter will give information about the background of the project, the organisation and the students.

1.1 Background

In Kasanka National Park (KNP) burning grassland is part of the park management programme. This is done once a year, to prevent large fires that can't be controlled. Dr. Michael Kennedy wants to know what the impact of burning grassland is on wildlife. Dr. Kennedy is also trying to find out what the effect of burning is on the plants nutritional values.

This project is being led by Dr. Kennedy in name of KNP. The goal is to set up a good grass burning plan. Dr. Kennedy is the supervisor of Pauline Smit and Janneke Steens, who will be working on a part of the project. These students will be trying to find out which burnt areas the puku prefers in terms of vegetation. There are different types of managing grassland to prevent burning; early burning, late burning and no burning.

Puku are very rare animals, but they are quite common in KNP. It is an important goal of KNP to maintain habitats so puku and sitatunga (another rare antelope) can survive. Therefore, it is important that the burnings do not have a negative effect on these animals.

1.2 Kasanka National Park

KNP lies in the northern part of Zambia and covers an area of approximately 420 square kilometres. KNP became a national park in 1972 but is already protected as a game reserve since 1946. Mr. David Lloyd is de founder of KNP and redeveloped the place in 1985 as a place of conservation.

KNP is run by 96 employees and Edmund Farmer is the manager of the park. Kim Farmer is the project coordinator. There are employees working on projects, like the local education and research projects. There are also people doing guide trainings and running the office, park and lodge.

1.3 The students

The students working on this project are both very interested in wildlife. They hope to gain information that they can use in the future, when they will possibly be working in the zoo. A lot of African animals can also be seen in Dutch zoos, so a game park in Africa is a good place to start gaining information. Kasanka National Park is very suitable for this purpose because it is a research park.

2. Formulation of the problem

In 8 weeks the students will try to get an answer to the main question:

‘What are the differences in feeding behaviour of puku on early-, late-, or no burn grass areas?’

The students will answer this question by answering the following research questions:

‘What are the puku’s social habits?’

‘What are the puku’s feeding habits?’

‘How many puku are being sighted in the early burn areas?’

‘How long do puku stay in the early burn areas?’

‘How many puku are being sighted in the late burn areas?’

‘How long do puku stay in the late burn areas?’

‘How many puku are being sighted in the no burn areas?’

‘How long do puku stay in the no burn areas?’

3. Formulation of the assignment

This chapter will give information about what the project will look like. It will cover the literature study, the research plan, the presentation and the goals of the project.

3.1. Literature study

First the students will study literature about the puku. This will be done by using the information that is available in KNP and books that have been brought with the students.

3.2. Research plan

The plots (the burned grass areas) will be studied four days a week in the morning. This will take four hours and there will be a scout guiding the students. At the plots there will be taken notice of how long the puku remain in one area. The students will also register how many puku there are feeding in one area. In one plot there are three burned areas containing early-, late- and not burned grass. These areas will be observed at the same time. This means that two students will be studying two plots at the same time. In the afternoon the students will be working along side Dr. Kennedy or shall be working on the data processing.

3.3. Presentation

In the end there will be given a presentation by the students about the findings concerning the study. The students will do the presentation together and start working on this in week 6 of the work experience. In week 8 the presentation will be given to the scouts, guides, Dr. Kennedy and other interested people.

3.4. Goals of the project

The main goal of the project is to learn how to perform a feeding behaviour research. This will lead to recommendations and advice for the park fire management plan. The internship in Zambia will also make the students more independent.

4. Project activities

The following activities will be part of the project:

Searching and reading literature

Having interviews with staff to get to know the park and animals

Making a 'plan of approach'

Writing a reflection report

Having a coaching interview

Perform observations

Writing a research report, which will include the following

Introduction

Material and method

Results

Discussion

Conclusion and recommendations
Give a presentation

The plan of approach and research report will be checked by Dr. Kennedy. The coaching interview will give the student an idea of how they are functioning.

5. Project limitations

Observations will take place four times a week for four hours a time. Four plots will be observed. The students will look at the feeding behaviour of the puku in the different burning areas. In the afternoon the students will be working on the research report or go with Dr. Kennedy into the park.

To make this project a success the random sample needs to be big enough. The time needs to be long enough to indicate a possible significant difference, so that the information given in the research report is reliable.

6.

6. Products

The following products will be produced:

Plan of approach
Reflection report
Summary of the coaching interview
Research report
Presentation

7.

7. Maintaining quality

The research will be described in detail in the research report. Background information is necessary to write a good report on the puku and its feedings behaviour. For information interviews can be held and literature can be read.

To process the information, knowledge gained at school can be used. Other written reports can also be used as a guideline for this report. Recent knowledge can be achieved from Dr. Kennedy.

The quality of the report can be maintained by weekly meetings with Dr. Kennedy. During these weekly meetings we can discuss the process of the report.

8.

8. Project organisation

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It will be hard to arrange meetings in the future, so next meetings will be arranged after each meeting. The reason for this is that the students live in Wasa Lodge and Dr. Kennedy lives in Mulaushi camp. Petrol is expensive, so there won't be daily transport between these two camps.

9. Time schedule

Date	Action	duration
07/02/2007	start work experience	8 weeks
07/02/2007	meeting with Dr. Kennedy	1 hour
08/02/2007	start field studies	appr. 6 weeks
08/02/2007	start plan of approach	2 weeks
21/02/2007	deadline plan of approach	-
22/02/2007	start research report	6 weeks
01/03/2007	deadline introduction	-
02/03/2007	deadline reflection report	-
07/03/2007	choaching interview	1 hour
08/03/2007	deadline material and methods	-
14/03/2007	deadline coaching report	-
19/03/2007	start presentation preparations	2 weeks
21/03/2007	last day field study	-
22/03/2007	start results and discussion	3 days
25/03/2007	deadline results and discussion	-
25/03/2007	start conclusions and recommendations	2 days
27/03/2007	deadline conclusions and rec.	-
27/03/2007	start format the report	3 days
29/03/2007	presentation	-
30/03/2007	end work experience	-
20/04/2007	deadline research report	-

The students will also try to have weekly meetings with Dr. Kennedy, this can't be arranged in advance. See chapter 7.

The students will also be working in the weekends to full fill the 8 weeks.

10. Risks

In a project like this there can be external and internal risks. These will be outlined underneath.

External risks

Because of the rain season plots maybe flooded and therefore not reachable, but there are a lot of other plots around. These can also be used.

Because of high petrol prices, transport between camps is limited and therefore Dr. Kennedy might be hard to reach, but Dr. Kennedy can be contacted by radio.

Internal risks

Lack of knowledge. This can be resolved by asking Dr. Kennedy for information or reading literature.

Problems with the internet. This can't be solved. The students don't need internet much, only for contact with Henco Vonk.

Limited amounts of literature available. This can be solved by talking to guides. They know a lot about Kasanka National Park and the animals.

Being eaten by some scary animal! This can be prevented by walking with scouts only!

The main risk is communication problems between Dr. Kennedy, Henco Vonk and the students. This needs to be solved by adapting to the limited communication that there is. The students need to write down all the questions they have, so that they can ask them all at once.



Appendix 9a

Figure 1 Exclosure showing vegetation growth within



Figure 2 Experimental plots in Wasa 1



Appendix 9b

Figure 3 Experimental plots in Wasa 1



Figure 1 The meeting room at the Kasanka Research Centre nearing completion



Figure 2 The chilli garden at the Kasanka Research Centre