

Protecting the Wildlife Corridors of the Queen Elizabeth Conservation Area



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Acronyms

CAP	Conservation Action Planning
CPI	Community-Protected Area Institution
DRC	Democratic Republic of Congo
ECOTRUST	Environmental Conservation Trust of Uganda
EIA	Environmental Impact Assessment
GVL	Greater Virunga Landscape
ICCN	Institut Congolais pour la Conservation de la Nature
JGI	Jane Goodall Institute
KEA	Key Ecological Attribute
KK	Kasyoha-Kitomi Forest Reserve
LFA	Logical Framework Approach
MOU	Memorandum of Understanding
NAADS	National Agricultural Advisory Services
NEMA	National Environment Management Authority
NFA	National Forest Authority
NGO	Non-governmental organisation
PA	Protected Area
PAC	Problem Animal Control
PRIME West	Productive Resource Investments for Managing the Environment Program/ Western region
QECA	Queen Elizabeth Conservation Area
QENP	Queen Elizabeth National Park
SEA	Strategic Environmental Assessment
TNC	The Nature Conservancy
UCF	Uganda Conservation Foundation
USAID	United States Agency for International Development
UWA	Uganda Wildlife Authority
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature

1. INTRODUCTION

The Queen Elizabeth Conservation Area (QECA) of western Uganda, with its outstanding scenery and diversity of habitats and fauna, is one of Uganda's foremost tourism attractions. The conservation area comprises the Queen Elizabeth National Park and the Kyambura and Kigezi Wildlife Reserves and forms part of the Greater Virunga Landscape (GVL), a 13,800 km² network of protected areas straddling the Democratic Republic of Congo (DRC), Uganda and Rwanda¹, Ranging in altitude from 600 to 5,100 metres above sea level, the GVL is one of the most biodiverse landscapes in Africa with many endemic and globally endangered species.

Linking between the different protected area components of the landscape are a number of "wildlife corridors", comprising narrow tracts of land hemmed in on both sides by dense human settlements and agriculture. These corridors play an important role in the functioning of the GVL ecosystem and in the protection of key habitats, and are especially crucial in enabling the movement of large mammals from one part of the ecosystem to another, in particular elephants, lions and chimpanzees. In the QECA-component of the greater landscape, there are seven critical wildlife corridors, four in savanna areas and three in forests (see section 1.2 below for a detailed description and location of the various corridors). Each of these corridors is under threat from neighbouring dense and increasing human populations and intensifying land use for agriculture and other economic activities.

This QECA Corridor Action Plan has been developed to ensure the continued functioning of these critical but increasingly fragile wildlife corridors, by providing a framework for coordinating and focusing the efforts of conservation organisations and other agencies working in the area on these weak links in the protected area landscape. The Wildlife Conservation Society (WCS) initiated the development of the action plan with financial support from USAID's PRIME West programme. Technical assistance in developing the plan has been provided by the Conservation Development Centre, Nairobi.

This introductory section sets out the purpose of the action plan, overviews the wildlife corridors targeted by the plan, and describes the methodology used to develop it.

1.1 Purpose of the action plan

The overall goal of this action plan is to ensure that the wildlife corridors of the Queen Elizabeth Conservation Area are conserved and that they continue to play their pivotal role in ensuring the ecological integrity of the Greater Virunga Landscape. Another important and complementary aim of the plan is to contribute towards the reduction of human-wildlife conflicts and the improvement of sustainable livelihoods of communities living alongside the wildlife corridors, thereby working towards the reconciliation of conservation and human development needs.

To achieve these overall goals, the plan has three main functions:

- ▶ to provide a framework for local government, protected area authorities and conservation NGOs operating in the region to work together in achieving improved corridor conservation and management.

¹ The Greater Virunga Landscape protected area network also incorporates the Virunga National Park (DRC), the Volcanoes National Park (Rwanda), and the Rwenzori, Semuliki, Kibale, Bwindi Impenetrable and Mgahinga Gorilla National Parks (Uganda).

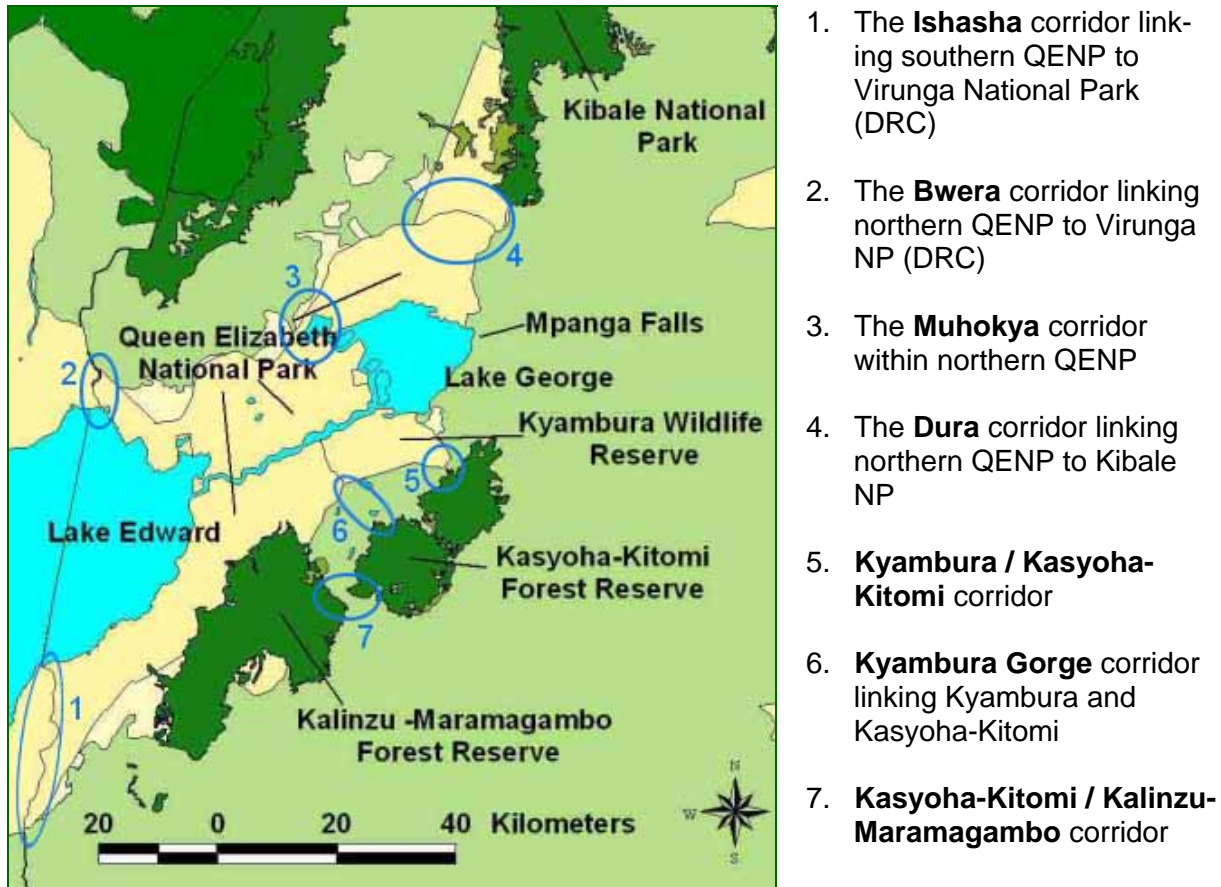
- ▶ to enable fundraising in support of corridor conservation initiatives. In this regard, the action plan is packaged into a series of specific corridor objectives with a set of discrete actions and institutional responsibilities assigned. This packaging will facilitate fundraising for specific plan components as well as the development of targeted proposals that will be attractive to the interests and priorities of donors.
- ▶ As a framework for engaging local communities in the conservation and use of corridor natural resources. The action plan incorporates a variety of initiatives to first raise awareness of the local communities in the conservation values of the corridors and the threats impacting on them, and then to enable the local communities to play a key role in conservation. Without this direct engagement, the neighbouring communities will continue to present a major threat to the maintenance of the corridor functions.

In the next section, the seven QECA wildlife corridors that are the focus of this action plan are introduced. This is followed by a section describing the planning methodology that has been used to understand the major values and functions of the corridors in the context of the Greater Virunga Landscape, and the major threats undermining these values and functions.

1.2 Overview of the wildlife corridors

Figure 1 below pinpoints the seven critical wildlife corridors that are the focus of this action plan. The corridors form vital bridges between QECA and neighbouring protected areas, in particular Kibale National Park to the north, Kasyoha-Kitomi and Kalinzu-Maramagambo Forest Reserves to the south-east, and DRC's Virunga National Park to the west.

Figure 1. The Queen Elizabeth Conservation Area and critical wildlife corridors



The QECA corridors can be loosely divided into two broad categories - savanna corridors and forest corridors - as shown below:

Savanna Corridors	Forest Corridors
<ul style="list-style-type: none"> ▶ Ishasha ▶ Bwera ▶ Muhokya ▶ Dura 	<ul style="list-style-type: none"> ▶ Kyambura / Kasyoha-Kitomi ▶ Kyambura Gorge ▶ Kasyoha-Kitomi / Kalinzu-Maramagambo

Within these categories, the corridors share a number of similarities, both in terms of their ecological characteristics and functions, the threats to these values and functions, and the institutions responsible for their management.

A brief overview of the QECA wildlife corridors is provided below.

1.2.1 Savanna corridors

The savanna corridors are particularly important for enabling the movement of elephants and large mammals within the Greater Virunga Landscape. Elephants are not only internationally endangered species, but serve as keystone species for seed dispersal for flora diversity in the ecosystem. The protected areas that make up these savanna corridors fall under the management responsibility of UWA.

The Ishasha / Virunga corridor is located on the western boundary of the southern sector of QENP, where the Ishasha River forms the international boundary with the Virunga National Park in the Democratic Republic of Congo (DRC). The transboundary wildlife migration between QECA and Virunga NP enabled by this corridor is vital to the health of the Greater Virunga Landscape and is one of only two corridors linking the two protected areas. In addition to the riverine woodlands along the Ishasha River, there is extensive woody grasslands that are important for topi and the tree-climbing lions, the latter being a major tourist attraction in Uganda, second only to the Mountain gorillas of Bwindi and Mgahinga National Parks.

The Bwera / Virunga Lubilia corridor is located on the western boundary of the northern sector of QENP and provides the second link between QENP and Virunga National Park. The corridor is a mixed wetland, grassland and woodland habitat that supports few resident wildlife species, but does serve as the only protected migratory route for wildlife moving from DRC to the northern sector of QENP.

The Muhokya corridor is a narrow strip of Queen Elizabeth National Park west of Lake George, which links the Kasenyi and Dura regions of the park. Muhokya village is an enclave in the park, which effectively narrows the corridor to about 100 metres width. This corridor is not only important for elephant movements, but also for Uganda kob, waterbuck and buffalo.

The Dura / Kibale NP corridor links QEPA to Kibale National Park and is part of the Lake George Ramsar site, the largest tract of wetland within QENP. In addition to the wetland, habitat includes grassland, swamp forest, woodland and bushland. This corridor is severely affected by poaching and heavy metal pollution from the past and present mining operations.

1.2.2 Forest corridors

The forest corridors are important for enabling the movement of primates and elephants between the protected areas. Management for these forest corridors falls under two authorities; firstly UWA, who are responsible for Kyambura Wildlife Reserve and wildlife outside of the

protected area system and secondly, the National Forest Authority (NFA), who are responsible for management of the specified forest reserves.

The Kyambura / Kasyoha-Kitomi corridor links Kyambura Wildlife Reserve to Kasyoha-Kitomi Forest Reserve and averages about 600 metres in width, but reduces to only 300 metres at its narrowest section. This corridor is important for the movement of large animals, such as elephants and chimpanzees.

The Kyambura Gorge / Kasyoha-Kitomi corridor is cut into the savanna landscape and contains dense riverine forest and a fast-flowing river that merges into papyrus swamp as the river approaches the Kazinga Channel to the north. The gorge is home to chimpanzees and other primates, lions and diverse birdlife. The Kyambura Gorge/ River provides an important corridor for primates (especially chimpanzees) to connect between Kasyoha-Kitomi Forest Reserve and Kyambura Wildlife Reserve/ QENP. As illustrated in Figure 1 above, a significant portion of this riverine corridor passes through community land.

The Kasyoha-Kitomi / Kalinzu-Maramagambo corridor links Kasyoha-Kitomi Forest Reserve with Kalinzu-Maramagambo Forest Reserve and is about three kilometres in width, much of which is grassland that local people have been allowed by the National Forest Authority to develop as pine and eucalyptus plantations. In addition to primates and elephants, the corridor provides connectivity for wild pigs, duikers, striped jackal, serval cats and genets.

Human activities, such as bush burning, cultivation and grazing have maintained the corridor as grassland, limiting movement of forest species such as chimpanzees, wild pigs and duikers. In addition, the corridor is a ridge, which is unfavourable for elephant movements.

1.3 Planning methodology

The planning methodology adopted to develop this action plan aims to build on the existing understanding of the QECA corridors to prioritise the actions needed to conserve them and to identify the institutions who have the mandate and resources to undertake such work. The following sections outline in detail the methodology employed.

1.3.1 Resource base information

All conservation planning and decision-making should be informed by up-to-date information concerning the key natural resources that make up the protected areas being managed. The principal source of information on the QECA corridors that has underpinned the development of this action plan has been from the activities undertaken by WCS over the past four years, with funding from USAID's PRIME West programme, to map out the QECA corridors, assess their functionality in terms of their use by wildlife, identify the threats to that functionality, and investigate options for their conservation. The references to the key documents consulted for this plan are given in section 5 and summaries regarding the QECA wildlife corridors, their values and functions, the major threats to these functions and the existing activities contributing to their conservation are presented in the relevant sections of this plan.

1.3.2 TNC's Conservation Action Planning process

The planning process adopted to identify the key ecological values and functions of the QECA corridors that should be priorities for conservation action was the Nature Conservancy's **Conservation Action Planning** (CAP) methodology. TNC have developed the CAP approach over many years and it has now been widely tested around the world. The methodology was developed as a way of assessing, managing and monitoring the status of an

ecosystem or conservation area by focusing on the most important biodiversity and ecological characteristics of the area. The CAP approach was chosen here because its aims are similar to the requirements of this corridor action plan and because it is a widely practiced and well-tested methodology.

The cornerstone of the CAP methodology is the identification of **conservation targets**, which are the key biodiversity components of a conservation area that are considered to represent the unique biodiversity of the area, the multiple spatial scales and levels of biological organisation, and the scale at which threats and management occur. In the context of this plan, the conservation targets were chosen to represent the key biodiversity components of the wildlife corridors and their pivotal role in supporting the integrity of the broader ecosystem. The conservation targets can be at the system level (e.g. river systems), or at the habitat/community level (e.g. a forest or woodland), or at the species level (e.g. a keystone species such as elephants that play a critical role in the ecosystem, or are a key characteristic of the ecosystem). Key questions that were considered when identifying the conservation targets for the QECA wildlife corridors were:

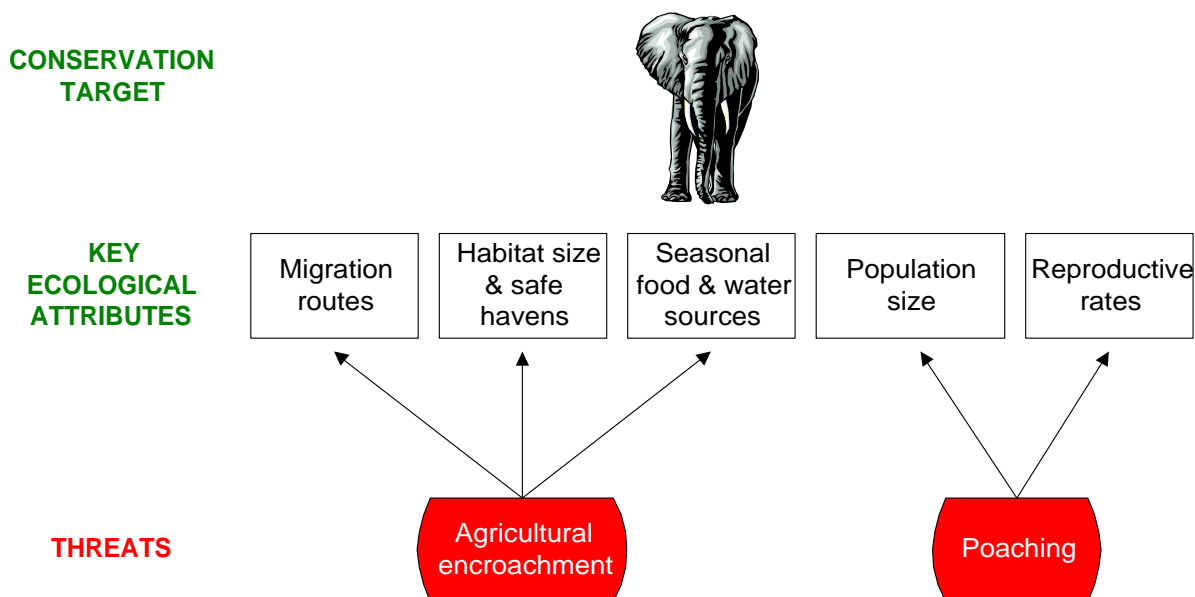
- ▶ At the **system level**, are the corridors a key component of wider ecological systems in QECA, which if lost would seriously degrade that system? For example, river systems or migratory systems.
- ▶ At the **habitat level**, do the corridors contain any critical habitats in their own right, or comprise important components of wider QECA habitats? For example, specific forest or wetlands habitats.
- ▶ At the **species level**, are the corridors critical for the survival of key species in the wider QECA ecosystem? For example, seasonal food supplies, breeding areas or connectivity between key habitats.

The CAP method also uses the concept of the **key ecological attributes** (KEAs) of the conservation targets, which can be defined as *“those factors of a conservation target’s ecology that if degraded would seriously jeopardise the target’s ability to survive over the long-term”*. KEAs are generally attributes of: biological composition (e.g. population size/structure, sex ratios, genetic diversity); environmental requirements (e.g. key habitats, prey species, connectivity); or ecological interactions (e.g. keystone species, fire). The KEAs provide the basis for determining the status of the conservation target. For each conservation target, a maximum of three to five key ecological attributes are chosen that are believed to be critical for the long-term viability of the target and that may be seriously degraded by human-caused threat.

The next stage of the CAP methodology is to determine and rank the stresses and sources of stress to the conservation targets and their key ecological attributes. For the purposes of developing this action plan, the division between stresses and sources of stresses was not made and instead **threats** in general were identified for the conservation targets and KEAs. Threats were defined as *“human pressures that result in the destruction or degradation of a conservation target or its key ecological attributes”*, and may either be current or likely to occur in the next ten years. The identified threats were ranked according to the level of damage (severity) and the geographic extent of impact on the conservation target at the site (scope).

Figure 2 overpage illustrates the relationship between the conservation target, its KEAs and threats to the KEAs in the case of the elephant conservation target that was identified for the QECA corridors. Five KEAs that relate to the wildlife corridors were identified as vital for the survival of elephants. Two of the threats impacting on these key ecological attributes were agricultural encroachment and poaching.

Figure 2. Example KEA's and associated Threats for the Elephant Conservation Target



The CAP methodology provides the basis for identifying actions that either reduce the threats to the conservation targets or enhance their conservation and ecological status. This step is detailed in section 3 below.

1.3.3 Stakeholder planning workshop

A stakeholder planning workshop was considered the most appropriate participatory mechanism for directly involving the main institutional stakeholders operating in the Queen Elizabeth Conservation Area as well as specialists in QECA corridor conservation ecological values and functions (see Annex 1 for the list of participants). Such participation in shaping the action plan is important from several perspectives: it raises awareness about the importance of conserving the QECA corridors; ensures that the plan is realistic and appropriately targeted; and provides the basis for obtaining support for the implementation of the action plan. A two-day action planning workshop was held at the Margherita Hotel in Kasese, in the heart of the QECA ecosystem and neighbouring several of the targeted corridors. During the meeting, a summary of the resource base information was presented and the CAP process was used to identify the QECA Corridor conservation targets, their key ecological attributes and their associated threats. This provided a framework for identifying the objectives and actions of the plan, and the roles of key institutions in implementing the plan. This action plan represents a refinement and elaboration of the outputs of the workshop (see Annex 2 for an outline agenda of the workshop).

2. CORRIDOR CONSERVATION TARGETS AND THREATS

As outlined under the planning methodology above, the TNC's CAP methodology was used to define and understand the QECA corridors' most important ecological values and functions, and subsequently to identify the major threats to these values and functions. Section 2.1 summarises the selected corridor conservation targets and their key ecological attributes, while Section 2.2 summarises the prioritised threats to these targets and KEAs.

2.1 Key values and functions of the corridors

Using the CAP methodology, workshop participants identified five conservation targets for each of the two categories of QECA corridors: savanna and forests (see Table 1 below). The targets chosen covered the various spatial scales and levels of biological organisation; from ecological systems and processes to individual species. As previously stated, when taken together the corridor conservation targets describe the unique biodiversity values and the key functions that the corridors play in maintaining the wider ecosystem.

Table 1. Savanna and forest corridor conservation targets

Ecosystem level	Savanna corridor Conservation targets	Forest corridor Conservation targets
Species	<ul style="list-style-type: none"> ▶ Elephants ▶ Lions 	<ul style="list-style-type: none"> ▶ Elephants ▶ Primates
Habitats	<ul style="list-style-type: none"> ▶ Acacia savanna woodland ▶ Savanna grasslands 	<ul style="list-style-type: none"> ▶ High forest ▶ Riverine forest
Systems	<ul style="list-style-type: none"> ▶ Lake/ wetlands system 	<ul style="list-style-type: none"> ▶ River system

The following sections summarise relevant information about each of the corridor conservation targets and define why they are considered important. For each conservation target, information is provided on which corridors are most important to them, their key ecological attributes and the major threats to the conservation target/ KEAs.

2.1.1 Elephants

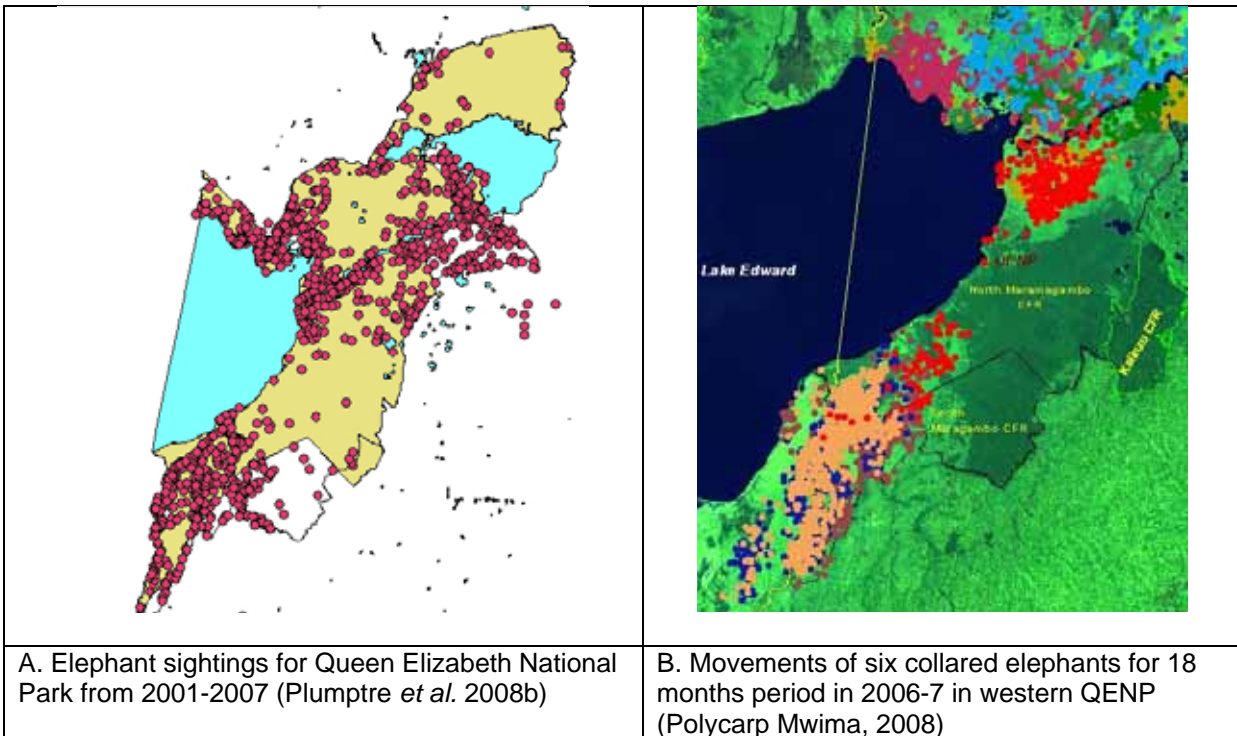
Critical corridors	Key ecological attributes	Major threats
<ul style="list-style-type: none"> ▶ Bwera ▶ Muhokya ▶ Dura ▶ Ishasha ▶ Kyambura - KK 	<ul style="list-style-type: none"> ▶ Migration routes ▶ Safe havens for security ▶ Seasonal food and water sources ▶ Elephant population size and reproduction rate ▶ Genetic variability 	<ul style="list-style-type: none"> ▶ Poaching ▶ Armed conflict ▶ Agricultural encroachment and human-elephant conflict ▶ Insufficient corridor width

Elephants are priorities for conservation in the Greater Virunga Landscape on account of their status as globally endangered species, their own specific threats from ivory poaching, their role in driving ecological processes within the ecosystem, and the fact that they are charismatic animals that can attract tourism revenue necessary to support conservation activities.

In turn the QECA corridors, in particular the savanna corridors (Ishasha, Bwera, Muhokya and Dura) and Kyambura-Kasyoha Kitomi, are important for the long-term survival of the GVL's elephants. The corridors enable elephant migration within the broader landscape, which is important for accessing seasonal food and water and for sustaining population size and genetic variability. Figure 3 below shows the location and movements of elephants within parts of QENP. The figure illustrates the elephants' heavy use of the savanna corridors, which contain their principal habitat, the savanna woodland. Elephants also utilise the corridors as important food and water sources and safe havens from poaching, which is reflected by the concentration of collared elephants in the Bwera and Ishasha corridors in Figure 3B below. The transboundary Ishasha and Bwera corridors have also played a critical role in

enabling elephant populations to escape localised insecurity in both Uganda (in the 1970s) and neighbouring DRC (since the 1990s) and to withstand poaching pressures.

Figure 3. Elephant usage of QECA corridors



Detailed censuses have not yet focused on the forest corridors, but Figure 3A does show elephant presence in the Kyambura / Kasyoha-Kitomi corridor. This corridor is particularly important to the elephants because Kasyoha-Kitomi Forest Reserve is too small in size to maintain a viable elephant population, and elephants therefore rely on the connectivity to Kyambura Wildlife Reserve (Plumptre *et al.* 2008b).

The key ecological attributes of the elephant conservation target in the QECA corridors are also important for other species. For example, elephants are known to be important seed dispersers for forest trees and therefore may be critical in maintaining some of the forest diversity.

Poaching is the main threat to the elephant conservation target in the QECA corridors. This is exacerbated by the current armed conflict and instability in eastern DRC. Another major threat to the elephant target is the shrinking size of the corridors due to encroachment from human populations (e.g. Muhokya villages) and agricultural conversion of land right up to the corridor boundaries. At Muhokya, the expansion of the village has been reported to now deter elephants from even entering the corridor.

2.1.2 Lions

Critical corridors	Key ecological attributes	Major threats
<ul style="list-style-type: none"> ▶ Ishasha 	<ul style="list-style-type: none"> ▶ Population size & reproduction ▶ Sufficient prey species ▶ Predator “cover” 	<ul style="list-style-type: none"> ▶ Poaching ▶ Poisoning ▶ Disease

The population of lions in QENP has been estimated at between 150 and 200 (Siefert, 2000). This plan focuses on the tree-climbing lions of the southern sector of QENP, which are a major tourist attraction in the park. This population of lions relies on the Ishasha corridor to maintain its population. The corridor enables movement of lions into DRC over the Ishasha River, which is important for maintaining a healthy population size and range. The corridor is also an important source of food for the lions due to the abundance of predator species, such as topi, and for the savanna woodlands and grassland vegetation that provides good cover for the lions when hunting their prey.

The major threats to the lion population at Ishasha are a result of human-lion conflicts, which are often initiated by lions attacking livestock, followed by pastoralists retaliating by poisoning the lions. In addition, the Ishasha lion population is vulnerable to poaching, as was highlighted by a recent WCS lion study in which one of the collared lions died from an infected wound from a snare. The other major threat to the Ishasha lion population is from diseases, such as Tuberculosis. The threats from poisoning, poaching and disease are thought to be the cause for the recent sharp decline in the Ishasha lion population, which fell from 36 at the end of 2005 to only 24 twelve months later (Owiunji & Plumtre, 2007).

2.1.3 Primates

Critical corridors	Key ecological attributes	Major threats
Forest Corridors	<ul style="list-style-type: none"> ▶ Genetic variability ▶ Population size (>1,000 for chimps) ▶ Fruiting trees throughout year ▶ Fallback fruiting trees 	<ul style="list-style-type: none"> ▶ Poaching

Primates are found in the three forest corridors (Kyambura Gorge, Kyambura / Kasyoha-Kitomi and Kalinzu-KK) and include: chimpanzees, Redtail monkeys, Blue monkeys, Black and white colobus monkeys, L’Hoest’s monkey, and baboons. The primates are the major tourist attraction within the associated forest reserves, and the chimpanzees and L’Hoest’s monkey are internationally endangered and threatened species respectively (UWA 2000).

These primates rely on the corridors to move between the forest reserves and Kyambura Wildlife Reserve in order to access the fruits in season, to access “fallback” fruiting trees when there is a food shortage, and to ensure genetic variability in the populations. In the case of chimpanzees, none of the individual forest reserves have estimated long-term viable chimpanzee populations (i.e. greater than 500) but together the forest reserves form a viable population of about 1,140, provided that the movements along the corridors can be maintained (Plumtre *et al.* 2008). At Kyambura Gorge corridor there is just one single community of 17 chimps, which are now trapped within the gorge due to intensive cultivation along the Kyambura River and reduced fig trees (for food) in the savanna areas. In turn, some of the KEAs of the primate populations are also thought to be important for the conservation of forest bird species.

The major threats to the primates are from poaching, which the workshop participants ranked as high, and the loss of corridor connectivity.

2.1.4 Acacia savanna woodland and savanna grasslands

Critical corridors	Key ecological attributes	Major threats
<ul style="list-style-type: none"> ▶ Savanna corridors 	<ul style="list-style-type: none"> ▶ Extent of cover ▶ Population size of grazing/ browsing species ▶ Species composition & re-generation 	<ul style="list-style-type: none"> ▶ Cattle grazing ▶ Fire ▶ Invasive species ▶ Agricultural encroachment ▶ Firewood collection ▶ Poaching

The workshop participants identified the acacia savanna woodland and savanna grasslands as key biodiversity components of the savanna corridors and crucial habitats for supporting the species diversity and landscape characteristics of the GVL. The corridors are important to these habitats by providing sufficient coverage, diverse species composition and adequate regeneration. These habitats are also KEAs for the elephant and lion conservation targets identified above, as well as other species that utilise the corridors for grazing and browsing, such as Uganda kob and topi.

The principal threats to these habitats are cattle grazing, uncontrolled fires and invasive species (e.g. *Lantana camara* and *Euphorbia candelabrum*), which the workshop participants ranked as being high level threats. Other medium level threats facing these habitats include poaching, firewood collection and agricultural encroachment.

2.1.5 High and riverine forest

Critical corridors	Key ecological attributes	Major threats
<ul style="list-style-type: none"> ▶ Forest corridors 	<ul style="list-style-type: none"> ▶ Forest matrix (species diversity and age structure) ▶ Dispersal ▶ Canopy connectivity (RF only) ▶ Mature mahogany for <i>Illadopsis</i> (HF only) 	<ul style="list-style-type: none"> ▶ Agricultural encroachment ▶ Cattle grazing ▶ Fires ▶ Timber extraction ▶ NTFP extraction ▶ Gold mining

As with the savanna corridors, the workshop participants identified two habitats that were considered important components of the forest corridors and important for ensuring the ecological integrity of the GVL. Firstly, the high forest habitat that is found in all three forest corridors and contains medium altitude moist evergreen and semi-deciduous trees. Secondly, the riverine forest that is a key habitat along the Kyambura, Rutondo, Buhindagi Rivers and is found in the Kyambura / Kasyoha-Kitomi and Kyambura Gorge corridors.

The survival of the high and riverine forest in the forest corridors depends on the maintenance of the level of species diversity, a balanced age structure of trees/ plants and the dispersal of seeds for continued regeneration. In addition, canopy connectivity is important for the maintenance of the riverine forest and a healthy population of mature mahogany is considered a key factor to the integrity of the high forest habitat. The protection of these habitats in turn supports a high diversity of butterflies and insects and, in the case of the Kasyoha-Kitomi corridors, the occurrence of Weynes duiker and Scaly breasted *Illadopsis*.

The main threat to these corridor habitats is from agricultural encroachment, which the workshop participants ranked as a very high level threat. Other major threats that were ranked as high include timber extraction, cattle grazing and fires.

2.1.6 River system

Critical corridors	Key ecological attributes	Major threats
<ul style="list-style-type: none"> ▶ Kyambura Gorge ▶ Kyambura / Kasoya-Kitomi 	<ul style="list-style-type: none"> ▶ Water quality (lack of siltation) ▶ Water catchment ▶ Water discharge rates 	<ul style="list-style-type: none"> ▶ Agricultural conversion ▶ Water diversion & extraction

At the system level, the Kyambura Gorge and Kyambura/ Kasyoha-Kitomi corridors are a key component of the GVL river system, which in turn is critical to the functioning of the landscape. The two corridors support the Kyambura, Rutondo, Buhindagi Rivers, and the loss of their water flow and quality would jeopardise the ability of the corridors to survive in their present form. This river network passing through the corridors is also important for supporting populations of fish, hippo, amphibians and migratory birds.

The main threat to the river system at these corridors is from agricultural encroachment, which was ranked as a very high level threat by workshop participants. A medium level threat to the corridor components of the rivers was the practice of water extraction and diversion by the local communities.

2.1.7 Lake/ wetlands system

Critical corridors	Key ecological attributes	Major threats
<ul style="list-style-type: none"> ▶ Muhokya ▶ Dura 	<ul style="list-style-type: none"> ▶ Water quality and quantity ▶ Breeding areas ▶ Wetland functions, e.g. filtering and erosion control ▶ Species diversity 	<ul style="list-style-type: none"> ▶ Water pollution ▶ Agricultural encroachment ▶ Cattle grazing ▶ Firewood collection

The lake and wetland system of QECA is one of the principal exceptional resources identified in the QECA General Management Plan (UWA 2000) and it plays a major role in defining the landscape. The system incorporates Lake George and the 250km² wetland on its northern shore, which in 1988 was included on the Ramsar Convention *List of Wetlands of International Importance*. It is considered one of the world's most productive aquatic ecosystems and serves important functions in the broader ecosystem, such as providing critical breeding areas, filtering pollution, and erosion prevention.

The Muhokya and Dura corridors are an important part of the wetland system and the survival of the wetland is closely linked to the conservation of these two corridors. In particular, the key factors ensuring the maintenance of the wetland system at the corridors are water quality and quantity and the continuation of critical wetland functions, such as filtering of contaminants and the prevention of soil erosion. In addition, the corridors are important to the wetland system for supporting the preservation of breeding areas for birds, fish and reptiles and for supporting species diversity in general.

The main threat to this system-level conservation target is pollution, which has principally been linked to contamination from nearby mining operations, including the former mining activities at Kilembe. Other medium level threats identified by workshop participants for this target include agricultural encroachment, grazing and firewood collection, which are all detrimental to the breeding areas and wetland functions.

2.2 Major threats to corridor values and functions

For each wildlife corridor, workshop participants identified and ranked threats from human pressures that are degrading or destroying the corridors' values and functions, as prioritised through the identification of conservation targets and key ecological attributes. The identified threats to the ecological viability of the conservation targets were ranked according to severity and scope as described above in section 1.2.2. The combined list of threats for both the wildlife corridors and their overall threat rankings is summarised in the targets-threats matrix overpage (Table 2).

The workshop participants identified a number of broad underlying threats to the corridors that should be addressed or taken into consideration by all the corridor conservation actions. The main underlying threat is negative community attitudes towards the conservation area and particularly by those members living adjacent to the wildlife corridors where human-wildlife conflicts are most severe. All actions should seek opportunities to involve local communities in corridor conservation and should actively seek ways for these members to receive tangible benefits, which offset the negative aspects of human-wildlife conflicts at the corridors.

Another underlying threat to conservation in the area which particularly affects the wildlife corridors is the poor natural resource management practices on adjacent community land. The factors driving this threat relate to the insecure land tenure arrangements for the corridor-adjacent communities, who consequently have little incentive to invest their time, labour and money in long-term sustainable land management practices that could provide a win-win situation for both corridor conservation and community livelihoods. Another factor is the lack of technical support the communities receive from the under-resourced and over-stretched local government to implement improved land management practices. All aspects of this action plan will seek ways to encourage and support better community land management practices at corridor sites.

The main categories of direct threats to the functioning of the corridors are clustered with grey shading in Table 2 and described below.

2.2.1 Poaching and insecurity

For the purpose of this plan, poaching covers any illegal killing of wildlife; such as the bushmeat trade, trophy hunting and the killing of problem animals that have destroyed community crops, livestock or property. Although poaching is a problem throughout QECA, the threat is especially high at the easily accessible wildlife corridors where wildlife is more visible and open to attack and more likely to stray into adjacent community land. Poaching continues to be a direct threat to the three species-level conservation targets for this plan (i.e. elephants, lions and primates). As mentioned above, a substantial loss of lions has been observed at the Ishasha corridor, which was mainly attributed to poaching (snaring) thought to be in retaliation for lion attacks on livestock (Owiunji & Plumptre, 2007).

On the positive side, the wildlife corridors can enable wildlife to escape from localised insecurity and poaching and, if secure, can provide a refuge or "safe haven" for wildlife. As mentioned earlier, elephants have used the transboundary Ishasha and Bwera corridors to escape the insecurity and armed conflicts in Uganda during the 1970s and in DRC since the 1990s.

Table 2. QECA Corridors Targets-Threats Matrix

Threats	Targets	River & wetland systems	Riverine forest	High forest	Acacia savanna woodland	Savanna grasslands	Elephants	Primates	Lions
Bushmeat/ trophy hunting/ poaching					Medium	Medium	High	High	Medium
Poisoning/ trapping							Medium		Medium
Armed conflict							Medium		
Firewood collection		Medium			Medium	Medium			
Poles and stakes collection			Medium	Medium					
Timber extraction			High	High					
Gold mining			Medium	Medium					
Water diversion & extraction		Medium							
Water pollution		High							
Oil exploration and drilling		Cross-cutting threat (unranked)							
Agricultural conversion/ encroachment		High	Very high	Very high	Medium	Medium	Medium		
Cattle grazing		Medium	High	High	High	High			
Fires/ bushfires		Low	High	High	High	High			
Invasive species					High	High			
Too narrow corridor							High		
Potential splitting of districts		Medium	Medium	Medium			Medium	Medium	
Inadequate private forest management			High	High					
Insecure land tenure			High	High					
Negative community attitudes aggravated by human-wildlife conflicts		Cross-cutting and underlying threat (unranked)							

2.2.2 Unsustainable natural resource use and pollution

Much of the unsustainable natural resources used and extracted from QECA are for the subsistence needs of local communities. Such resource extraction is most acutely felt at the edges of the protected areas due to ease of access, which means that wildlife corridors are particularly vulnerable. At the forest corridors, the workshop participants identified timber, poles for local construction and stakes for farming as the main resources unsustainably extracted, whilst at the savanna corridors, firewood collection was considered the most damaging and unsustainable resource extracted. At the Kyambura Gorge and the Kayambura/Kasyoha-Kitomi corridors, river water has been extracted and diverted for local agriculture. Industrial pollution also affects the Dura and Muhokya corridors, where the lake/ wetland system is polluted from past and present mining operations (including heavy metal contamination from the former Kilembe Mine operation). Although not specific to the QECA corridors, an emerging potential threat to the integrity of the ecosystem is from the recent initiation of oil exploration and drilling within the Ugandan portion of the Albertine Rift.

For more information on natural resource extraction see Appendix 1 of the QECA General Management Plan (UWA, 2000).

2.2.3 Habitat loss

Habitat loss is particularly detrimental at the wildlife corridors, which are already considered to be too narrow to be viable (especially Kyambura-Kasyoha Kitomi and Muhokya corridors). Any further habitat loss or degradation to these corridors will reduce their ability to protect the identified habitat and system-level conservation targets and, over time, the corridors will increasingly be avoided by migrating and resident wildlife, as already seems to be the case at Muhokya for elephants. One of the main threats to habitat loss, especially at the forest corridors, is agricultural conversion, which has increasingly formed a hard-edge with the corridor boundaries and, in certain cases, has led to encroachment within the PA boundary. Other threats to habitat loss include livestock grazing (principally within the savanna corridors) and the expansion of human settlements (e.g. at Muhokya). In addition, uncontrolled or deliberate fires have led to the loss of vegetation diversity; this has been the case at Kalinzu/ Kasyoha-Kitomi corridor, where fire has been used to convert the corridor to grazing land, which is less nutritious or palatable for wildlife. In some savanna corridors, especially at Muhokya, exotic species (including *Lantana camara*) have been introduced that have out-competed the indigenous species.

A potential future threat to the forest corridors is the proposed splitting of Bushenyi District in two, which would lead to increased infrastructure and social services associated with a new district headquarters and administration. Such developments, in addition to leading to increased pressure on the forest reserves in general, may lead to a new access roads cutting across one or more of the forest corridors.

3. CORRIDOR CONSERVATION OBJECTIVES & ACTIONS

As reported on above, the CAP methodology used at the stakeholder planning workshop enabled the workshop participants to identify a focused list of corridor conservation targets, key ecological attributes and associated threats. The subsequent determination of objectives and actions focused either on reducing the threats to the corridor conservation targets or on enhancing their conservation and ecological status. The QECA Corridor Targets Threats Matrix (see Table 2 above) was collated at the workshop and provided a useful visual analysis of the CAP outputs to guide the identification of a package of objectives that together address all the main corridor conservation issues. In essence, an objective and its associated actions can either address crosscutting threat(s) to a number of targets (e.g. agricultural encroachment, which affected six out of the eight corridor conservation targets), or a set of specific threats to an individual corridor conservation target (e.g. elephants, which had six specific threats).

The corridor objectives and actions were initially formulated at the stakeholder planning workshop and later refined and elaborated for this action plan by the planning facilitators. The final corridor objectives address four main cross-cutting clusters of threats that emerged from the Targets-Threats Matrix in Table 2 above. The four objectives are:

- Objective 1. Collaboration and support for corridor management and conservation strengthened
- Objective 2. Elephant and other human-wildlife conflicts in and around corridors mitigated and community support for corridor conservation strengthened
- Objective 3. Sustainable natural resource use and management promoted and supported at critical corridors
- Objective 4. Corridor conservation and restoration requirements and management alternatives identified and implemented

These corridor conservation objectives and their actions are described in detail in the sections below. Under each objective there is a brief description of the relevant issues and opportunities that are being addressed. Concluding each objective section is an overview of the relevant past and ongoing activities that implementers of the actions should be aware of and seek to build upon.

Objective 1: Collaboration and support for corridor management and conservation strengthened

The first objective focuses on the government agencies that have responsibility for the conservation of the QECA corridors. The corridors are a part of lands managed by three different agencies. UWA have management authority for QENP and Kigezi and Kyambura Wildlife Reserves, the National Forest Authority (NFA) manages the central forest reserves, and the local government have responsibility for the land adjoining these protected areas. Each authority has different agendas and priorities, which has tended to result in a lack of adequate coordination and allocation of responsibilities in corridor conservation action. This objective seeks to address this issue by facilitating the development of an effective collaboration framework for these authorities to jointly conserve the corridors. This in turn will raise the awareness of the value of these corridors, strengthen support for their conservation, and help in the effective coordination of joint law enforcement around the corridors.

In order to address the inadequate institutional collaboration mechanisms in corridor conservation, the following actions have been identified:

Action 1.1 Develop collaboration agreements between the different agencies managing the QECA corridors

The first action will seek to develop and establish management agreements between UWA, NFA and local government for the coordinated management and conservation of the QECA wildlife corridors. Once the nature of the collaboration has been agreed upon, efforts will be made to formalise the roles and responsibilities in appropriate Memoranda of Understanding. The development of MOUs will provide the basis for drawing up annual workplans for collaboration.

Action 1.2 Enhance law enforcement collaboration in conserving the corridors

Action 1.2 seeks to practically implement the collaboration agreements between the different authorities responsible for corridor management (Action 1.1). The action will practically support the implementation of joint law enforcement patrols and information sharing between UWA, NFA and local government. This support will involve developing and testing collaboration protocols for law enforcement and installing communication systems that enable effective communication channels between the different authorities. These communication channels will be important for coordinating joint patrols and for facilitating timely intelligence gathering and information sharing. The participating authorities will vary depending on the corridor: for the forest corridors, joint law enforcement will be between UWA, NFA and local government, whilst for the savanna corridors, coordinated patrols will only be between UWA and local government.

In the case of the transboundary Ishasha and Bwera corridors, poachers have in the past escaped from the Ugandan rangers and prosecution by crossing over the border into DRC. In order to catch and prosecute such poachers, it is necessary to coordinate law enforcement between Uganda and DRC. This action will therefore also build on the ongoing efforts to improve transboundary law enforcement by strengthening the cooperation between UWA and ICCN (Institut Congolais pour la Conservation de la Nature - with management responsibility for Virunga National Park, DRC). The action will support the coordinated UWA-ICCN patrols along the international boundary and provide other training and support that improves the capacity of the two authorities to work together. This support could cover French and English language training to improve communication between the two authorities and training in developing intelligence gathering and information sharing networks on illegal activities. In addition to supporting UWA-ICCN collaboration, the action will work with the police, judiciary and customs and immigration officers on both side of the border to improve their ability to successfully catch and prosecute poachers (see Action 1.3).

Action 1.3 Carry out sensitisation of law enforcement officers and the judiciary regarding the importance of wildlife and the threat posed by illegal hunting and resource extraction

In addressing the challenges of poaching and other illegal activities affecting the wildlife corridors, it is important to raise awareness amongst the responsible agencies about the importance of wildlife, their dependence on functioning corridors and the detrimental impact of illegal hunting and unsustainable resource extraction. The sensitisation of law enforcers (including UWA, NFA, police, customs and immigration) and the judiciary will clearly articulate what the laws of Uganda state regarding these illegal activities and what their responsibilities are concerning upholding the law.

Relevant completed and ongoing activities

- ▶ Snare removal continues to be undertaken by JGI and NFA in Kasyoha-Kitomi Forest Reserve
- ▶ *The WCS Conserving Corridors in the Greater Virunga Landscape Project.* A major focus of the project was to implement transboundary law enforcement and cooperation activities. A process was initiated for integrate the activities and information sharing between UWA, ICCN and the police, judiciary, customs and immigration and other law enforcement agencies. In addition customs, immigration and UWA officials were trained regarding the Uganda laws governing the trade in wildlife and materials (1,000 posters and 500 guide book) were produced identifying the tradable species. Support was also provided for coordinated UWA-ICCN patrols along the border with DRC, and to renovate a patrol boat and provide an outboard motor that allows UWA to patrol Lake Edward and respond to emergencies more rapidly in the southern sectors of QENP (Owiunji & Plumtre, 2007)

Objective 2: Elephant and other human-wildlife conflicts in and around corridors mitigated and community support for corridor conservation strengthened

The second objective focuses on addressing conflicts between wildlife species utilising QECA's wildlife corridors and neighbouring communities. QECA's wildlife corridors are characterised by what is termed a "hard edge", which means that there is a direct proximity between the corridor and dense human settlement, with no transitional or buffer area to minimise interactions between wildlife and people. As a result, human-wildlife conflicts are at their most intense in all the QECA corridors compared with the main protected areas. Of these, human-elephant conflict is the most intense, and is characterised by elephant crop raiding and retaliation and elephant killings by the affected communities. At Muhokya corridor, the human-elephant conflicts have been so intense that elephants have now stopped using the corridor altogether.

Mitigation of human-wildlife conflicts is important from two main perspectives. Firstly, these conflicts have a direct impact on the status of the wildlife species concerned, both in the short-term through death or injury, and in the longer term through the prevention of traditional migration and dispersal movements, as in the case of the Muhokya elephants above. Secondly, these conflicts have an equally profound impact on the livelihoods, and sometimes the lives, of community members. Mitigating human-wildlife conflicts will not only improve the well-being of the communities, but also bring about a "peace dividend" with more stable communities practicing sustainable land-use, and with stronger support for both the wildlife species and the corridors themselves. A prosperous community at peace with wildlife is less likely to work to eliminate the wildlife species concerned and the corridors themselves.

Building on this peace dividend, this objective will seek to strengthen community support for corridor conservation, through targeted sensitisation about corridor values, developing opportunities and incentives for community-involved law enforcement and working with communities to resolve long-running corridor boundary disputes.

In order to address the conflicts impacting on the corridors and to garner community support for corridor conservation, the following actions have been identified:

Action 2.1 Implement sensitisation programmes to raise community awareness of corridor values and boundaries

Action 2.1 seeks to raise community awareness about the values of wildlife using the corridors, the importance of respecting the corridor boundaries and preserving the corridors. This activity complements the subsequent actions under this objective, which are aimed at reducing human-wildlife conflicts and improving communities' attitudes to the corridors and the wildlife that use them. The sensitisation will explain the negative impact that degrading or losing the corridors will have on the broader ecosystem and the community livelihoods. The sensitisation efforts will include reaching out to local government, who have responsibility for supporting the local communities to sustainably manage the land bordering the corridors. The action is expected to enhance the law enforcement efforts and where possible create openings for more community involvement in such activities, as outlined in Action 2.6 below.

Action 2.2 Establish and maintain elephant barriers at corridor conflict hotspots

One proven strategy that has been employed in QECA to reduce human-elephant conflict is to establish barriers between community land and protected areas. This strategy is especially relevant for wildlife corridors, firstly because the barriers prevent elephants venturing into adjacent community land, which is usually the event that initiates the human-elephant conflict cycle, and secondly because the barriers discourage human encroachment and other illegal activities in the corridor areas. Consequently, the barriers help to maintain the corridors and increase the chances of elephants utilising these narrow tracts of land.

The second action under this objective will therefore support the construction of barriers along prioritised corridor boundaries abutting human populations and agricultural land, especially in human-elephant conflict hotspot zones. Depending on the terrain and geography, this may entail trenches and/ or valley fences. In addition, the action will ensure that mechanisms are in place to regularly maintain the barriers to ensure their continued effectiveness. In the case of elephant trenches, maintenance involves the regular cutting of the surrounding vegetation and digging out any mud to maintain the trench walls. One approach to enhance the effectiveness of elephant trenches is to grow Mauritius thorn (*Ceasalpanea decapitate*) along the top of the trenches. Such barrier maintenance and enhancement practices will involve giving the local communities ownership of the barriers, in conjunction with the PA authorities, and for long-term financing to pay those tasked with maintenance.

Action 2.3 Support PAC schemes to deter elephant crop raiding whilst earning income for corridor-adjacent communities

Besides barriers, a variety of problem animal control (PAC) mechanisms have been tested in western Uganda and elsewhere in Africa designed to deter elephant crop raiding. Action 2.3 seeks to develop selected PAC methods that have been successfully used elsewhere, in order to complement and strengthen the elephant barriers developed under the previous action. PAC measures that have already proven to be effective alongside the existing QECA elephant barriers are crop guarding and disturbance (e.g. scare shooting and fire crackers). In addition to promoting these measures, the action will seek to pilot additional innovative PAC measures that can also generate income for the corridor adjacent communities.

One specific PAC scheme that this action will seek to replicate around the QECA corridors is the use of chilli pepper as a deterrent to keep elephants off the community land and safely in the corridors. Chilli peppers contains the irritant capsicum, which is strongly disliked by elephants. Growing chilli peppers as a crop has proven a very successful elephant deterrent in

Zimbabwe as well as in other countries in Africa, including Kenya, Namibia, Zambia and Botswana. In addition, farmers have used the chillies to make olfactory elephant repellents, such as producing noxious smoke from burning chilli mixed with elephant dung, or smearing chilli based grease on rope.

The major additional benefit of the chilli pepper scheme is that the chilli can be sold as a cash crop and thereby can bring in additional revenue to the farmers, which can increase their tolerance to future human-elephant conflicts. The Elephant Pepper Development Trust (www.elephantpepper.org) has been at the forefront of successfully promoting and supporting such initiatives. The commercial side the Trust, the Elephant Pepper Company (www.elephantpepper.com), has successfully created a global market for chillies and so is able to pay the chilli farmers a fair price.

Action 2.4 Support programmes to rehabilitate and provide economic opportunities to ex-poachers

As mentioned previously, the successful reduction of human-wildlife conflicts adjacent to the QECA corridors is likely to improve community attitudes to both the corridors themselves and the wildlife such as elephants that use them. This in turn is likely to have a positive impact on the reduction of poaching in the corridors, which in the past has been severe because of the proximity between corridors and dense settlement and adverse attitudes to corridors in the communities. In addition, stronger and clearer barriers around the corridor areas will also contribute to enhancing law enforcement in the corridors (see action 2.6 below).

To consolidate all these efforts aimed at reducing human-wildlife conflict and improving law enforcement in the corridors, Action 2.4 will seek to provide alternative income opportunities for those poachers from around the corridor areas that make a commitment to stop poaching, e.g. surrendering their poaching equipment. This action directly builds on an initiative undertaken by the PRIME West programme that established an Ex-Poachers Association, which assisted members to improve their returns from coffee farming by introducing better processing methods that enable farmers to obtain higher prices, and through employment with UWA and WCS (e.g. cleaning UWA Staff compound and offering labour to biological survey teams).

Action 2.5 Target park-community benefit sharing schemes at corridor-adjacent communities

As has been noted, the QECA corridors are hotspots for human-wildlife conflicts, and as a result the neighbouring communities often have very poor relations with the PA authorities as well as negative attitudes towards QECA and its wildlife. Action 2.5 therefore seeks to improve park-community relationships at these corridor sites by encouraging the QECA benefit sharing schemes, such as the QECA Revenue Sharing Programme, to affirmatively target corridor-adjacent communities that incur a disproportionate share of the costs of living with wildlife. Such benefit-sharing schemes will help to encourage local support for corridor conservation and increase community tolerance and acceptance of elephants and other wildlife that use these corridors.

Action 2.6 Identify and implement innovative, community-involved law enforcement mechanisms at corridor areas

It is hoped that the previous actions aimed at reducing human-wildlife conflicts, increasing conservation benefits and sensitising the corridor adjacent communities will provide a solid

foundation for developing new opportunities to involve the corridor-adjacent communities in supporting law enforcement. Community-based law enforcement is not only important for creating local ownership and responsibility for corridor conservation, but it is also a pragmatic approach to policing these corridors, which tend to be located far from ranger posts on the edges of the protected areas.

This action will draw on the successful experience of community wildlife conservancies in Northern Kenya, which have selected members of their community to serve as scouts to patrol the wildlife conservancies. Key learning points from Northern Kenya experience include the need to provide elected community scouts with effective communication channels to link up with better equipped PA law enforcement units and back up. Another important ingredient is that the community scouts perceive that their efforts are linked to tangible benefits. In the Northern Kenya community conservancies, these tangible benefits come from ecotourism revenues and improved general security in the area (e.g. the reduction in cattle rustling and banditry). At the QECA corridors, tangible community benefits could be the support in developing alternative income-generating activities around the corridors (see objective 3 and 4) or from support in reducing human-wildlife conflicts, as described above.

Action 2.7 Resolve boundary conflicts and improve construction of PA corridor boundaries as appropriate

Action 2.7 focuses on boundary disputes at Ishasha, Muhokya and Kyambura/ Kasyoha-Kitomi, where there is pressure for more land for settlement (e.g. Muhokya) and agriculture (e.g. Kyambura/ KK). The boundaries of the corridors in these areas are unclear, in part due to the lack of clear boundary beacons on the ground. The lack of permanent markers also creates opportunities for deliberate encroachment. For example, at Kyambura/ Kasyoha-Kitomi the boundary river have been diverted to increase land for the community (Plumptre *et al.*, 2008). This action will work with the communities to clearly establish and verify the corridor boundaries and, where appropriate, to construct permanent visible boundary markers.

Relevant completed and ongoing activities

- ▶ *The WCS Strengthening Elephant Conservation in the Greater Virunga Landscape Project.* This project was funded by US Fish and Wildlife Service and concluded in 2008. Its objective was to strengthen ICCN and UWA's ability to tackle the elephant poaching problem in the Greater Virunga Landscape and in particular the Virunga National Park
- ▶ PRIME West/ WCS/ CARE/ UCF/ UWA have all been involved in the excavation of elephant trenches and investigations have been undertaken to initiate chilli pepper as a problem animal control measure. A summary of elephant trenches and other deterrents tested around Kibale National Park and their effectiveness and associated costs is given in Nampindo & Plumptre (2005; p.20).
- ▶ *The WCS Lion Project* was established in November 2005 to study lion ranging, population size, and human-lion conflicts. The study area covered the Kigezi Wildlife Reserve and the southern part of QENP. Plans are in place to continue this project with funding from WCS's Carnivore Programme (Owiunji & Plumptre, 2007)

Objective 3: Sustainable natural resource use and management promoted at critical corridors

The third objective focuses on addressing the degradation and loss of habitat at the QECA wildlife corridors. Although habitat degradation and loss is a pressure around the entire

QECA boundaries, it is particularly acute at the hard edge boundaries of the wildlife corridors where the surrounding dense human populations are characteristically poor, natural resource dependent households. The gradual loss of transitional or buffer areas between the QECA wildlife corridors and neighbouring land means that these local communities are increasingly looking to the adjacent protected areas for natural resources and land. The main resources that are unsustainably extracted from the QECA corridors are timber, building poles, stakes, firewood, whilst habitat loss at these corridors mainly results from encroachment for agriculture and grazing.

By promoting and supporting corridor adjacent communities to practice more sustainable natural resource use and management, and by linking these to alternative income-generating activities, it is hoped that this objective will address the significant threat of habitat loss and degradation. As initiatives to promote more sustainable natural resource management exist around most PA systems in Uganda, it will be particularly important to link this objective with existing initiatives at the local and national level, including those of the National Agricultural Advisory Services (NAADS) programme and the National Environment Management Authority. The following actions have been identified to promote sustainable and innovative natural resource management and use at the corridor areas:

Action 3.1 Support appropriate community economic enterprises that promote corridor conservation

The first action focuses on promoting alternative livelihood activities and enterprises that will reduce the natural resource dependence of the local communities surrounding the wildlife corridors. The establishment of private tree nurseries and woodlots could provide alternative sources for timber, firewood, poles and stakes currently extracted from the corridors. In addition to providing materials for household needs, these woodlots could generate income through marketing locally or linking to carbon trading schemes (see Action 4.2 below). In addition, enterprises could be developed to sell fuelwood saving stoves or innovative energy technologies (e.g. biogas).

The other major threat to the corridors is from encroachment for cattle grazing and agriculture. This threat will be addressed by promoting improved agricultural and livestock husbandry techniques (see Action 3.2) and by promoting alternative livelihood enterprises that increase income at the household level and, wherever possible, linking the enterprise to the protection of the surrounding biodiversity. One potential enterprise is community ecotourism, which could be developed at the Ishasha-Virunga corridor (with the attraction of tree-climbing lions and savanna woodlands and riverine habitat), the Kyambura Gorge corridor (with its resident chimpanzee population and beautiful scenery) and the Dura/ Muhokya corridors (which incorporate the globally important Lake George wetland habitat and its associated fauna). Other potential livelihood enterprises that would reduce food insecurity and pressure on the wildlife corridors include planting high value crops (e.g. vanilla or coffee) in corridor buffer areas, or establishing piggeries and planting of fruit trees in corridor adjacent communities.

This action will undertake feasibility assessments to identify viable alternative activities and enterprises that could be developed around the wildlife corridors. These assessments will build on the best practice and lessons learnt from similar initiatives undertaken in the region. The piloting of promising alternatives will focus on training and building the capacity of local entrepreneurs to take the lead in establishing and running the enterprises and ensuring proper financial management and sustainability is achieved. Where the pilot activities are successful, mechanisms will be put in place for enabling scaling up and replication if appropriate. For enterprises that are seeking to access national or international markets, it will be important to develop the enterprise in partnership with private companies and investors.

Action 3.2 Identify and promote sustainable natural resource use practices in and around corridors

Action 3.2 is at the core of this objective and seeks to promote more sustainable use of legally accessible natural resources from the corridors and to improve agricultural, livestock and riverbank practices around the QECA corridor.

Although schemes are already in place to enable communities to extract a variety of natural resources from QENP and the forest reserves, establishing and enforcing a sustainable off-take has been difficult to implement. As these practices are especially destructive in the wildlife corridors, this action will seek to provide guidance and an enforcement mechanism for achieving a sustainable off-take through the establishment of formal collaborative management agreements between PA authorities and the local communities at critical corridors (especially the forest corridors). The action will build on the collaborative forest management activities that are being piloted in a number of parishes around Kasyoha-Kitomi Forest Reserve by Nature Uganda and WWF. Of particular relevance is the community forest management agreement between the National Forest Authority and local community at the Kalinzu / KK corridor on the south-facing slopes of Lubare ridge, which contains a lease agreement governing the planting of Eucalyptus trees.

Agricultural encroachment and cattle grazing are a threat to all the habitats and systems critical to the QECA corridors. This action will therefore seek to partner with local government, the National Agricultural Advisory Services (NAADS) and appropriate NGOs (e.g. International Centre for Agroforestry) to promote sustainable agricultural practices around all the corridor sites. This will include soil and water conservation and improved agricultural technologies to improve productivity on the corridor-adjacent land (e.g. construction of trenches, bunds, planting cover crops, and tree cover restoration to address soil degradation and fertility decline). The action will also promote good livestock husbandry and stocking levels, particularly at the Muhokya, Dura and Bwera corridors. The adoption of more sustainable agricultural and livestock keeping practices should be a requirement for those corridor communities receiving support for developing alternative enterprises (see Action 3.1).

Another component of this action will seek to promote better enforcement and management along the riverbanks, in particular the Kyambura, Rutondo, and Buhindagi Rivers that pass through the Kyambura Gorge and Kyambura / Kasyoha-Kitomi corridors. These rivers are under increased threat from charcoal production (depleting the riverine forest) and sedimentation from poor agricultural practices (e.g. slash and burn, soil erosion, expansion of agricultural plots close to the riverbanks). In places, the rivers form the boundaries of the forest reserves. However, some of these boundary rivers have been diverted by people near the Kyambura / Kasyoha-Kitomi corridor in order to access more land in the forest (Plumptre *et al.*, 2008).

Action 3.2 will strengthen the management of these riverbanks in collaboration with local government, Wetlands Inspection Division and the National Environment Management Authority. This will involve resurveying the Kyambura, Rutondo, Buhindagi Rivers at the wildlife corridors to ensure that a 50-200m buffer strip or Protection Zone is being respected, the construction of permanent marker posts, the development of ordinances (district) and bylaws (sub-county level) to support the enforcement of these protection zones, and the restoration of the river banks with indigenous plant species where necessary.

Action 3.3 Enhance private forest management capacity

One specific unsustainable land management threat that workshop participants singled out for the QECA forest corridors relates to the poor management standards of private forest land adjacent to the corridors. Forests and woodlands on community land have traditionally formed important buffer areas to the forest corridors. However, these important corridor buffers have been either cut down or mismanaged. Although local government is mandated to provide technical support to these communities in managing such forests and woodlands, they have been too under-resourced and over-stretched to provide such support.

Action 3.3 will seek opportunities to strengthen private forest management around the forest corridors through cooperation between the National Forest Authority and local government. This will involve technical support for the establishment and management of woodlots/ plantations that were identified in Action 3.1 as potential new sources for generating income for the communities and alternatives to natural resources in the corridors.

Action 3.4 Implement mechanisms to reduce the impact of fires in corridor areas

Workshop participants identified fire as a major threat impacting on habitats and systems critical to the QECA corridors. Action 3.4 aims to reduce the impact of fires by working with the NFA and UWA to develop and implement simple fire management plans for corridors, including the establishment and maintenance of firebreaks (fire lines) in the fire sensitive areas of corridors, the development of schedules/ procedures for early burning, and agreed roles and responsibilities for forest fire fighting. The action will seek the active participation of the corridor-adjacent communities in fire management, particularly regarding the maintenance of firebreaks and participation in fire fighting.

Relevant completed and ongoing activities

- ▶ *The JGI Kalinzu Ecotourism Project* is undertaking environmental education and conservation awareness in primary schools and communities, in particular using cultural drama for transmitting conservation messages.
- ▶ *Participatory Environmental Management in Uganda (PEMA II) project* that is managed by Nature Uganda/ WWF. The project is targeting seven parishes around Kasyoha-Kitomi Forest Reserve and in November 2008 will have its Mid-Term Review. The project aims to improve sustainable natural resource management and the equitable rights and access to forest resources, in particular through the development and signing of Collaborative Forest Management Agreements between the communities and NFA, capacity building and enhanced livelihood strategies.
- ▶ *Productive Resources Investment for Managing the Environment in Western Uganda (PRIME West)*. This programme (Dec 2003 - Jul 2008) sought to pilot practical initiatives that bring biodiversity conservation/ sustainable natural resource management and economic development together in Uganda's Albertine Rift (including QECA).

Objective 4: Corridor conservation and restoration requirements and management alternatives identified and implemented

The last objective takes a more strategic approach to the conservation of the QECA corridors and the maintenance of their functions in supporting the broader ecosystem. Whilst the previous objectives have sought to respond to the immediate threats to the wildlife corridors, this objective looks at future threats as well as options for the restoration of the wildlife corridors so that their role as critical and integral components of the broader GVL landscape is sustained in the long term.

In order to ensure that the QECA corridors remain viable, the following actions have been identified:

Action 4.1 Undertake measures to address threats from industry

While the previous objectives have concentrated on addressing corridor threats chiefly originating from communities neighbouring wildlife corridors, Action 4.1 seeks to address current and future large-scale industrial threats to the corridors, which often originate from much further afield. There are presently two main industrial threats in the QECA ecosystem. The first is the threat posed by mining operations that are located to the north of QENP. The pollution from these operations releases contaminants into the surrounding ecosystem, which directly impacts on the Muhokya and Dura corridors. These corridors are also impacted by the continued heavy metal contamination that was created by the now closed Kilembe Mines.

The second major emerging threat to all the QECA corridors is from oil exploration and drilling in the Albertine Rift. Although exploration activities have not yet started around QECA, it is probably only a matter of time before prospecting commences. In July 2007, Dominion Uganda Limited signed a Production Sharing Agreement with the Ugandan Government granting it exclusive rights to explore for petroleum in Block 4B (an area of about 2,000 km² covering the southern part of QECA).

Action 4.1 will support measures to minimise the current and future threats to the QECA corridors posed by industrial-scale disturbance and pollution. In the case of oil exploration, this will involve developing a “sensitivity atlas” for the QECA corridors, as part of a regional initiative by WCS and NEMA to develop a sensitivity atlas for oil exploration in the entire Ugandan portion of the Albertine Rift. The sensitivity atlas comprises a digital map containing different GIS layers that identify both the key ecological attributes (identified in section 2.1 above) and socio-economic attributes of the protected area that are potentially impacted by oil exploration. The atlas will inform decision makers about the environmental threats posed by specific development activities (e.g. a drilling site or a pipeline) and the desirability of a development proceeding taking into account its environmental costs. The atlas will also help to identify recommendations for reducing the environmental impacts of industrial developments on the protected areas, and for putting in place contingency plans in the eventuality of industrial accidents, such as oil spills.

The action will also promote the development of a Strategic Environmental Assessment for the QECA landscape with regard to oil exploration/ production, and for the mining to the north of QENP. The SEA will provide an overview of environmental considerations and potential impacts at the landscape level and will be used to influence high-level decision-making concerning national economic policies, regional strategic plans and investment programmes in the QECA region. An SEA facilitates the early consideration in the planning

process of broader environmental impacts and alternatives, which it would be too late to consider in an EIA of a specific development or project.

Action 4.2 Identify and purchase land critical for corridor restoration

As has been already described in section 1.2, several of the QECA corridors are very narrow. The two extreme cases are the Muhokya and Kyambura/Kasyoha-Kitomi corridors, which at their narrowest are both less than 1km in width. Action 4.2 will seek to purchase land critical to restoring these two corridors to a more viable size and shape.

The Kyambura/Kasyoha-Kitomi corridor has now become too narrow (average of 600m) for species such as elephants and chimpanzees to move through. The action will seek to purchase sufficient land to increase the corridor's width to at least 1km (500 metres either side of the river) in order to lessen the risk of human-wildlife conflict and to allow free movement of animals. WCS has provisionally estimated the cost of purchasing the required 66 hectares of land to be US\$142,805, excluding administration and legal fees (Nampindo *et al.* 2006).

In the case of the Muhokya corridor, the expansion of the village has effectively reduced the corridor to about 100 metres at its narrowest point, making it unusable by elephants. Workshop participants recommended negotiating a change in the village shape with the community, moving people to a longer strip along the Kasese-Bushenyi road and reducing the width of the village. However, this will be a politically contentious option and will also require UWA to agree to lose some of the national park and accept to restore some existing cultivated land. The result would be to increase the width of land that animals can move through (Nampindo & Plumpre 2005).

Action 4.2 is not likely to be realised in the short term, but by building on the outputs of the previous three objectives, it is expected that the development of improved relationships between the local communities and the conservation agencies and the adoption of more sustainable land management outside the corridors will mean that local people will become more willing to sell their land. In parallel to identifying and negotiating the purchase of land with the owners, this action will need to value the land and to find the necessary funds to purchase it (for details on funding options see Nampindo *et al.* 2006: p.29).

Action 4.3 Investigate and implement innovative alternatives to land purchase for corridor restoration

If the option of purchasing land critical to the identified corridors under Action 4.2 does not bear fruit, it will be necessary to look at other long-term alternatives to restore corridor functionality. Action 4.3 will promote innovative alternatives to land acquisition for the Muhokya and Kyambura / KK corridors, and also for other QECA corridors where the PA system is deemed to protect insufficient land (e.g. Kalinzu / KK corridors).

One alternative for securing land critical to corridor conservation is for the government to lease land directly from community members for exclusive use for wildlife conservation. An initial study by WCS asked the 30 households who own the 66 hectares critical to the Kyambura / KK corridor whether they would be willing to rent their land. Only ten of the households accepted the idea of renting their land and requested a *monthly* fee of US\$129 per hectare. This rate is exceptionally high, considering one hectare of land is *annually* rented for US\$56 per hectare for agricultural purposes. Clearly considerable negotiations will be needed to make this a realistic option (Nampindo *et al.* 2006).

A second alternative that this action will investigate is to provide economic incentives to corridor-adjacent communities to protect the key environmental services on their land (often called Tradeable Development Rights for Environmental Services). This could be done either through establishing **conservation easements**, which are legal agreements between a landowner and a land trust or government agency that permanently limits uses of the land to protect conservation values, or through **transfer payments** (see Nampindo *et al.* 2006: p.27). These initiatives could be linked with carbon trading and tourism developments (see Action 3.1 above).

Action 4.4 Undertake specific corridor restoration activities

Action 4.4 addresses specific corridor restoration activities that are identified by stakeholders before and during action plan implementation. One specific activity identified by the workshop participants is the creation of an alternative corridor for the 17 chimps inhabiting the Kyambura Gorge. Currently, these chimps depend on moving through community land to get to the Kasyoha-Kitomi Forest Reserve. The action will involve UWA agreeing to the planting of savanna figs in QENP in order to restore a corridor between Kyambura Gorge and Maragamambo forest.

Relevant completed and ongoing activities

- ▶ *WCS study investigating increasing corridor functionality in the Greater Virunga Landscape* (funded by Conservation International's Global Conservation Fund). This study produced a number of reports; of particular relevance is Nampindo *et al.* (2006), which focused on the management options for increasing the functionality of the Kyambura / Kasyoha-Kitomi corridor.
- ▶ *ECOTRUST (Environmental Conservation Trust of Uganda)* has experience of initiating and supporting carbon trading schemes for providing private sector opportunities for linking conservation to income generation.

4. FIVE-YEAR ACTIVITY PLAN AND RESPONSIBILITIES

The following pages set out the Five-Year Activity Plan, detailing the actions, priority corridors, institutional responsibility, and timeframe necessary for the delivery of each action over the next five years. In addition, the plan sets out specific milestones that are expected to be achieved in implementing the plan.

Actions	Priority corridors	Institutional responsibility	Timeframe					Milestones									
			Y1	Y2	Y3	Y4	Y5										
Objective 1: Collaboration and support for corridor management and conservation strengthened																	
1.1 Develop collaboration agreements between the different agencies managing the QECA corridors	All corridors	WCS, UWA, NFA, local government															
1.2 Enhance law enforcement collaboration in conserving the corridors	Ishasha and Bwera	UWA, WCS															
	Kasyoha Kitomi, Kyambura Wildlife Reserve, Kyambura Gorge	NFA, UWA, local government, NGOs															
	Muhokya, Dura	Local government, UWA, NGOs															
1.3 Carry out sensitisation of law enforcement officers and the judiciary regarding the importance of wildlife and the threat posed by illegal hunting and resource extraction	Forest corridors	JGI, Nature Uganda, local government and NFA															
	Savanna corridors	NGOs (e.g. UCF), local government and UWA															

Actions	Priority corridors	Institutional responsibility	Timeframe					Milestones											
			Y1	Y2	Y3	Y4	Y5												
Objective 2: Elephant and other human-wildlife conflicts in and around corridors mitigated and community support for corridor conservation strengthened																			
2.1 Implement sensitisation programmes to raise community awareness of corridor values and boundaries	All corridors	UWA, NFA, NGOs (JGI/ Nature Uganda for forest and UCF for savanna corridors)																	
2.2 Establish and maintain elephant barriers at corridor conflict hot-spots	Muhokya, Dura, Bwera, Ishasha, Kyambura-KK	UWA, NGOs																	
2.3 Support PAC schemes to deter elephant crop raiding whilst earning income for corridor-adjacent communities																			
2.4 Support programmes to rehabilitate and provide economic opportunities to ex-poachers																			
2.5 Target park-community benefit sharing schemes at corridor-adjacent communities																			
2.6 Identify and implement innovative, community-involved law enforcement mechanisms at corridor areas	All corridors, especially Muhokya, Dura, Kyambura – KK	UWA, NGOs																	
2.7 Resolve boundary conflicts and improve construction of PA corridor boundaries as appropriate	Muhokya, Ishasha, Kyambura-KK	UWA, NFA, local government																	

Actions	Priority corridors	Institutional responsibility	Timeframe					Milestones									
			Y1	Y2	Y3	Y4	Y5										
Objective 3: Sustainable natural resource use and management promoted and supported at critical corridors																	
3.1 Support appropriate community economic enterprises that promote corridor conservation	Areas where PA protects insufficient corridor	UWA, ECOTRUST, NGOs (PEMA and UCF)															
3.2 Identify and promote sustainable natural resource use practices in and around corridors	All corridors	Local government, Wetlands Inspection Division and NEMA, NGOs (Nature Uganda, ICRAF)															
3.3 Enhance private forest management capacity	Forest corridors	WCS, NFA and local government															
3.4 Implement mechanisms to reduce the impact of fires in corridor areas	All corridors	UWA, NFA and WCS															
Objective 4: Corridor conservation and restoration requirements and management alternatives identified and implemented																	
4.1 Undertake measures to address the threats from industry	All corridors, esp. Muhokya and Dura	NEMA, UWA, WCS, WWF															
4.2 Identify and purchase land critical for corridor restoration	Kyambura / Kasyoha-Kitomi, Muhokya	WCS, UWA, local government, ECO-TRUST															
4.3 Investigate and implement innovative alternatives to land purchase for corridor restoration	Areas where PA protects insufficient corridor	WCS, UWA, ECO-TRUST, WWF, / private sector (e.g. tour operators/ investors)															
4.4 Undertake specific corridor restoration activities																	

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ANNEXES

Annex 1. Participants at QECA Corridor Action Planning Workshop

Name	Position	Organisation
Alastair McNeilage	Country Director	Wildlife Conservation Society
Balaam Mwijukye Asimwe	District Planner	Kamwenge District
Charles Police Mugisa	District Planner	Kasese District
David Byaruhanga	District Planner/ Statistician	Bushenyi District
David Sancho Niwagaba	Project Officer	PEMA/ NatureUganda
Debby Cox	Executive Director	Jane Goodall Institute Uganda
Panta Kasoma	Chief of Party	PRIME West
Geoffrey Muhanguzi	Project Officer	CARE International, Uganda
Haruna Kulu Kirya	Tourism Warden, Rwenzori MNP	Uganda Wildlife Authority
Johnson Bwambale	Chair LCIII Muhokya Sub county	Kasese District
Nelson Natukunda	Chair LCIII Kihhi Sub county	Kanungu District
Patrick Agaba	Project Officer	Uganda Conservation Foundation
Polycarp Musimami	PhD student, MUIENR	MUIENR/ECOTRUST
Rob Craig	Programme Manager	CDC (workshop facilitator)
Rob Malpas	CEO	CDC (workshop facilitator)
Robert Bagyenda	Western region wetland officer/ PhD Student, MUIENR	Wetland Management Department
Robert Esimu	Range Manager South Western Uganda	National Forestry Authority
Simon Nampindo	Greater Virunga Manager	Wildlife Conservation Society
Tom Okello	Chief warden, QECA	Uganda Wildlife Authority

Annex 2. Agenda for QECA Corridor Action Planning Workshop

Workshop objectives

- ▶ To identify and map the key ecological features and functions of the QECA wildlife corridors and their associated threats
- ▶ To agree the purpose and focus of the QECA corridor action plan and the intended implementers and participants
- ▶ To identify priority actions to conserve the QECA corridors in the medium-term

Workshop agenda

Day 1:

- ▶ Presentation on the role and importance of wildlife corridors for the conservation of QECA
- ▶ Exercise to map the corridors and their key ecological features and functions
- ▶ Presentation on prioritising key ecological features and functions of corridors: the use of TNC's Conservation Action Planning (CAP) process
- ▶ Exercise to identify corridor conservation targets and key ecological attributes
- ▶ Exercise to identify and rank the main threats to QECA corridors

Day 2:

- ▶ Discussion on the purpose and focus areas of corridor action plan and the intended implementers and beneficiaries
- ▶ Presentation on developing corridor action plans based on CAP conservation targets, KEAs and threats
- ▶ Exercise to identifying corridor action plan objectives and implementation roles
- ▶ Discussion on the existing corridor conservation activities already underway
- ▶ Exercise to identify priority actions to enhance the functions of corridors and to reduce threats
- ▶ Next steps for finalising the corridor action plan and AOB