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Human Wildlife Conflict: Lessons Learned From AWF's African Heartlands

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The AWF Working Paper Series has been designed to disseminate to partners and the conservation community, aspects of AWF current work from its flagship African Heartlands Program. This series aims to share current work so as to provoke discussions on whats working or not and how best conservation action can be undertaken to ensure that Africas wildlife and wildlands are conserved forever.

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Cover photo: Elephant speared by community members outside Amboseli National Park (credit Soila Sayialel, Amboseli Elephant Research Program).

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Table of Contents

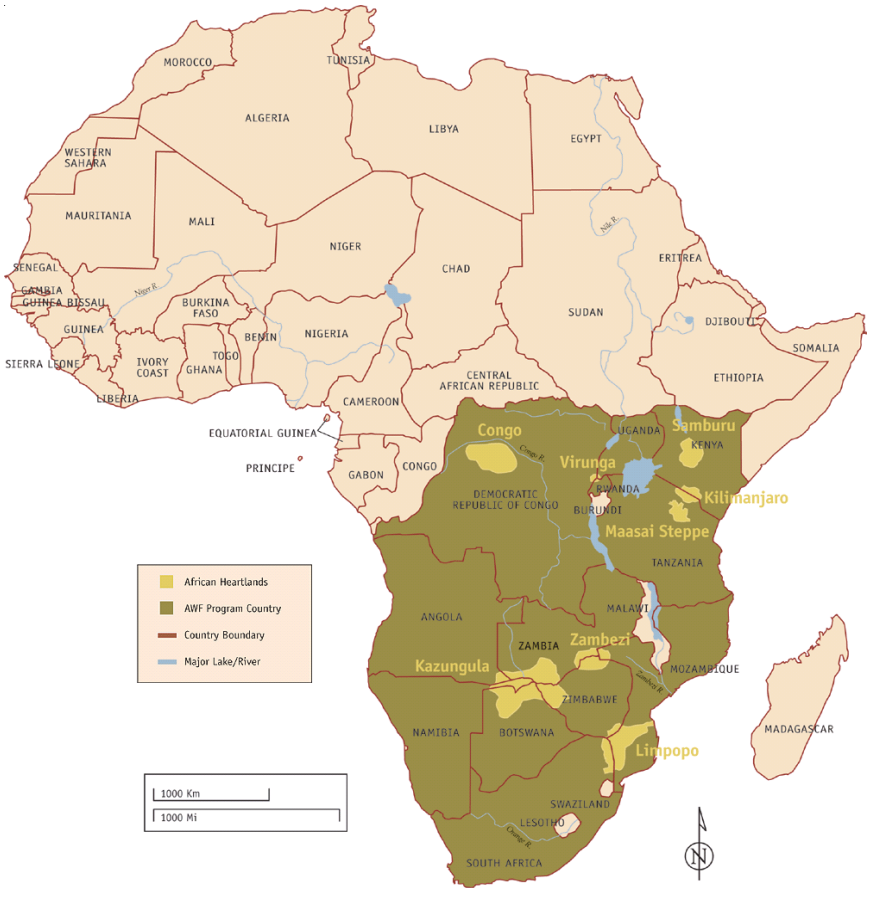
Introduction

In the developed world potentially dangerous megafauna have largely been exterminated as a result of the spread of agriculture, growth of human populations and increased urbanisation – and often a deliberate attempt to do so. In much of Europe, for example, species such as wolves that once roamed widely across the continent have been eradicated along with the habitat in which they lived; tiny remnant populations cling on in a very few remote, sparsely populated areas. In Britain the last wild wolf – the island's only large carnivore – is believed to have been killed in 1743. And even in 2005, the Norwegian government approved the killing of five of the country's twenty remaining wolves to protect sheep (Kirby, 2005).

In Africa large numbers of big mammals, including several hundred thousand wild elephants and more than 20,000 lions, still roam freely, particularly in rangeland areas. The pastoralist people who live in these regions, and the agropastoralists and other settled small and large-scale farmers and their families who live around their peripheries, all have to cope with the consequences: damage to and destruction of crops, livestock predation, competition for grazing and water, increased risk of some livestock diseases, various inconveniences – such as loss of sleep due to protecting crops at night – and even direct threats to human life. As human populations rapidly increase (the population in African came close to tripling in the four decades from 1960) and settled agriculture spreads to more marginal rangelands, conflict between wildlife and people inevitably increases.

In many of AWF's African Heartlands[1] (see map) much of the wildlife lives outside protected areas; for example, across the continent, 80% of the elephant's range is outside such areas. This raises a fundamental question: is it reasonable to expect people, many of them amongst the poorest on the planet, to co-exist with wild animals such as large predators, elephants and herds of antelope, to absorb the ensuing economic losses and tolerate the inconveniences and threats to lives and livelihoods that can result? Many conservationists would argue co-existence is possible, even desirable, and indeed that if properly managed the presence of wildlife represents an opportunity, a possible escape route from poverty. But this puts the onus squarely on those responsible for the management of wildlife to put in place policies and measures that at least reduce the threats posed by wildlife and preferably enable local people to reap benefits – such as revenues from wildlife-based tourism enterprises. Without such policies and measures in place, local people will, understandably, often take action to defend their interests – even their lives - including harassing and killing wild animals. Some of these species are endangered, others keystone species, and so the repercussions of such local direct actions can be felt at national and international levels.

Conflict between people and wildlife today undoubtedly ranks amongst the main threats to conservation in Africa - alongside habitat destruction



[1] Current AWF Heartlands are Lopori Wamba, Kazungula, Kilimanjaro, Limpopo, Maasai Steppe, Samburu, Virunga and Zambezi

and commercially motivated hunting of wildlife to satisfy the demand for bush meat - and represents a real challenge to local, national and regional governments, wildlife managers, conservation and development agencies and local communities (Kangwana 1993, Conover 2002, Treves and Karanth 2003).

The aim of this paper is to:

- Stimulate reflection and discussion on the issues surrounding human-wildlife conflict
- Document human-wildlife conflict in AWF's Heartlands
- Provide an overview of measures which have been applied to mitigate conflicts between people and wildlife
- Provide references that can provide more detailed information
- Summarize the lessons learnt
- Suggest what AWF should be doing to address human-wildlife conflict in its African Heartlands.

Human-Wildlife Conflict in AWF Heartlands

Conflicts between human and wildlife have been extensively documented in the various AWF Heartlands, including: Samburu (carnivores: Ogada *et al.* 2003, Frank 1998; elephants: Thoules 1994, Thoules and Sakwa 1995; and other animals: Ogada and Ogada 2004), Kilimanjaro (elephants: Kangwana 1993, Kikoti 2000; carnivores: Rainy and Worden 2003), Maasai Steppe (elephants: Foley 2002, carnivores: Kissui 2004) and Virunga (mountain gorillas: Mcfie 2003, Woodford *et al.* 2002; buffalo: MacFie 2003). In some areas crop damage by wildlife is perceived as a major problem facing farmers; it threatens to undermine conservation and development efforts in the northern districts of Zimbabwe (mid Zambezi Elephant Project 2002). Within the Zimbabwe portion of the Zambezi Heartland, elephants are estimated to be responsible for up to three-quarters of all crop damage caused by wildlife. An exception is the Limpopo Heartland where little human-wildlife conflict has been reported but where most of the wildlife areas are fenced (Munthali, personal communication).

Human-wildlife conflicts can have adverse impacts on wildlife and humans alike. In Kilimanjaro Heartland, Muruthi *et al.* (2000) found that in 1996 and 1997 at least 15 elephants, representing three-quarters of the local population's mortality, had been killed in conflict situations with local people. Between 1974 and 1990, one third of elephant mortalities (141 of 437 deaths) in the Amboseli ecosystem were caused by people, for example through spearing (Kangwana 1993). The main problems in the Kilimanjaro Heartland are crop damage, competition for water and grazing, killing of livestock and risk of disease transmission, and human fatalities. In semi-arid areas in general, where livestock production constitutes a major part of local livelihoods, high levels of conflict can occur between livestock owners and wild carnivores due to predation.

In Virunga Heartland, habitat destruction and human population growth mean that the mountain gorilla and other forest animals, such as elephant and buffalo, are increasingly coming into contact with people, often leading to conflicts. The impact on local people, many of whom are subsistence farmers, can include economic devastation through destruction of crops, living in a state of fear, inconvenience, and danger to life and limb (Macfie 2003). For mountain gorillas, interactions with local people are a source of stress, can result in the transmission of human diseases, and can lead to direct physical attacks, disabilities such as loss of limbs from snares, and even death: 18 mountain gorillas were killed between 1996 and 2003 in Virunga and Bwindi (Woodford *et al.* 2002).

Nearly all species of wild animals are capable of inflicting damage, although large potentially dangerous species, those that gather in large groups, and those that are most wide ranging are more likely to cause problems than smaller species with restricted ranges. In the Samburu Heartland, Ogada and Ogada (2004) documented the species of wildlife responsible for killing livestock and reported that such deaths were due to: lions (35% of reported deaths), leopard (35%), hyena (18%), baboon (4%), elephants (3%), buffalo (2%), wild dog (2%) and cheetah (1%). Generally, detailed information on economic losses due to human-wildlife conflicts is lacking for the AWF Heartlands.

Approaches to Managing Human-Wildlife Conflicts

There are two basic approaches to managing human-wildlife conflicts: prevention and mitigation. A rather different approach is represented by changing attitudes to wildlife through education and by ensuring that affected communities and individuals are active participants in, and enjoy tangible benefits from, wildlife management.

Preventive Measures

Measures that can prevent or minimise the risk of conflicts arising between people and animals include the extreme one of completely removing either the people or the animals, physically separating the two by the use of barriers, managing by a variety of means the numbers of animals to reduce the risk of conflict, and employing a variety of scaring and repelling tactics.

Eradication

In the past local people were removed from large tracts of land when these were formed into national parks and other protected areas. Eradication of animals such as lions, leopards, elephants, buffalo, rhino and the larger species of antelope has been undertaken in the past over large areas of Africa, such as the former white farming areas in the Kenyan Highlands and large parts of South Africa. Today, wildlife managers, landowners and traditional land-users in Africa still sometimes deliberately kill species that they consider represent a threat – ranging from elephants to quelea - with a view to reducing the population, or even locally exterminating that species. Methods used include various types of traps and snares, hunting with dogs, shooting, roost sprays, poisons and the deliberate introduction of diseases – the latter tried, unsuccessfully, against introduced rabbits in Australia. In some instances, eradication of large carnivores has been linked to sports hunting and in others to systematic widespread elimination by trained agents (Treves and Naughton-Treves 1999).

Today it is generally considered unjustified to attempt to eliminate entire populations of animals unless those targeted are an exotic alien species. Where eradication is attempted, it is desirable to use properly trained staff to minimize impacts on non-target species and ensure the process is humane. Illegal persecution of predators, including poisoning, shooting and trapping, is perhaps the greatest threat to these species in AWF Heartlands today.

Although killing animals can reduce human-wildlife conflict, the relationship is rarely straightforward. Population reduction often results in an increase in birth rate, a decrease in other causes of mortality, and an increase in immigration of naïve animals into the area. Managers must also be aware of, and mitigate against, the possible consequences of eradicating certain species from a locality. These include upsetting ecosystem function and dramatic changes in the populations of other species. A phenomenon called 'mesopredator release' can arise, for example, when small to medium-sized carnivores proliferate following removal of large carnivores (Crook 2002). Similarly, profound changes to the local flora and landscape can occur as a result of eliminating elephants. Consequently, eradication attempts have a mixed record of success, in part due to lack of adequately understanding the species' interactions with its environment and the natural resources valued by humans.

Managing the Size of Populations

Falling short of total eradication, there are a number of approaches to managing the size of the population to reduce the risk of human-wildlife conflict arising. These include selectively killing animals as well as controlling their reproduction.

Regulated Harvesting

In many regions of the world, wildlife species and the damage they can cause are managed by regulated harvesting or cropping. A policy of sustainable harvest needs to include some means of scientifically monitoring populations, using methods sensitive enough to detect significant declines. The programmes should have prescribed, enforceable limits on the number and type of animals that can be harvested, as well as on the timing, location and methods of hunting, and allow for the distribution of benefits, such as meat, to stakeholders. Regulated hunting placed in the hands of local people can increase tolerance for potentially dangerous wild animals such as carnivores. By combining regulated hunting with preservation tactics, wildlife managers can optimize political, economic and ecological priorities.

Regulated harvests of wildlife species occur in several AWF Heartlands. To date, their impact on alleviating human-wildlife conflict has not been documented by AWF but it would be desirable to assess the impact of such measures.

Fertility Control

As an alternative to killing animals, their fertility can be controlled as a means of limiting their populations. Fertility control of wild animals can, at least in theory, be achieved by a variety of mechanical, surgical, endocrine disruptive or immunocontraceptive methods. One problem limiting many such methods is the difficulty of administering drugs to or capturing free-ranging animals. Contraception as a wildlife management tool is still largely at an experimental stage;

attempts to utilise immunocontraceptive methods in elephants began in Kruger National Park in 1996 (Butler 1998) but to date have met with little success. A similar project attempted in the Samburu Heartland (Kenya Wildlife Service unpublished report) was abandoned in its early stages following a change of senior management at Kenya Wildlife Service and differences in opinion as to the potential effectiveness of such an approach.

Exclusion by Use of Physical Barriers

Exclusion of wild animals by use of physical barriers can, in many situations, be an effective method of settling human-wildlife conflicts. If they are properly designed, constructed and maintained, fences can be completely effective in preventing conflict between people and wild animals. The major factor limiting the wider use of wildlife fences is their cost. This will vary depending on many factors among them topography, type of fence and the species it is designed to contain; the 3.3 metre-tall, electrified fence currently being constructed around Aberdare National Park in Kenya costs on average US$20 per metre.

Fences to exclude elephants and other wildlife from human settlements, cultivated areas and livestock areas are in use in all Heartlands. Stone walls have been used to exclude buffalo from invading cultivated areas in Virunga Heartland. Trenches and moats have been used to keep elephants from cultivated areas with considerable success. The fencing-in of the cultivated areas of Kimana and Namelok in Kilimanjaro Heartland has significantly reduced levels of crop damage (Musila *et al.* in preparation). In Samburu Heartland, Ogada *et al.* 2003 reported that fences and modifications of traditional stockades significantly reduced livestock predation. However, predator-proof barriers require more maintenance than normal livestock-proof ones. Exclusionary devices are also used for stopping mammals from destroying trees – for example to stop elephants from destroying the few remaining acacia tress in Samburu National Reserve. Whatever their nature, exclusionary devices are most appropriate when effectiveness is more important than cost, and when the human-wildlife conflict is expected to persist for the foreseeable future.

Fear-Provoking Stimuli

Fear-provoking stimuli, be they visual (such as scarecrows), auditory (such as exploders, bangers, and distress calls) or olfactory stimuli (used to repel predators) have all been applied to resolve human-wildlife conflicts. Though widely used, these methods face a common problem because the animals soon learn that they pose no real threat and then ignore them. Traditional methods such as chasing, lighting fires at the edge of fields, beating drums and throwing objects at animals also face the same problem of habituation. A method commonly used by wildlife authorities is disturbance shooting, that is firing shots over the heads of crop raiding wild animals, but this too becomes less effective over time.

A variety of fear-provoking stimuli are applied in AWF Heartlands but their effectiveness has not been documented. Kangwana (1993 and 1995) observed that around Amboseli National Park elephants tend to avoid Maasai people and their livestock when resources are not scarce but that incidence of elephants being harassed and speared by people increased during the dry season as competition for water intensified.

Guarding Crops and Livestock

Watchtowers that provide good vantage points, built around fields of crops, increase the farmers' chances of their being alerted to the presence of potentially harmful wildlife before damage has occurred. Simple alarm systems, using string and cowbells or tins, can also be effective and avoid the farmer having to be alert all night long. Dogs can be effective in protecting homesteads and livestock from attack by predators. Donkeys have also been used in many parts of the world, including against cheetah in Namibia, to protect flocks of sheep and goats from predation.

Chemical Repellents

Another way to alter animal behaviour with the goal of resolving human-wildlife conflicts is the use of chemical repellents. Area repellents are designed to keep wildlife out of an area, contact repellents are attached or sprayed to a food item and systemic repellents incorporated within the food plant or item. Chemical repellents have been used in some of the AWF Heartlands including pepper sprays to deter elephants in Zambezi Heartland (Osborn 2002). The experimental use of conditioned taste aversion, however, at Loisaba Ranch in Samburu Heartland failed to reduce livestock predation (Forthman-Quick 1999). The Mid Zambezi Elephant Project has championed the use of grease and an extract of hot chillies mixed together and applied to string. The idea was that, when an elephant touches the string, the chilli extract caused irritation to the animal. Another method used to deter elephants is to burn elephant dung mixed with ground chillies to produce a noxious

smoke that can persist as a deterrent for up to four hours.

While the use of chemical repellents to deter elephants has shown some promise (www.africanow.org; Osborn 2002), conditioned taste-aversion has not been successful and is currently not being used in any of the Heartlands. There is a need to look for chemical repellents effective against African carnivores as lithium chloride, though effective against coyotes in the USA, has not proven to be effective (Forthman-Quick *et al.* 1985).

Use of Diversion

A less commonly used approach is the use of diversionary tactics – providing an alternate source of food or water in an attempt to lessen competition with people for crops or water sources. Successful use of diversionary fields to reduce crop damage has been reported in USA (Conover 2002). The main drawback is that wildlife numbers can increase over time, due to immigration, reproduction and enhanced survival, for example when diversionary food is provided when natural foods are scarce. Stopping a diversion programme might even result in higher levels of damage than before. No examples of the provision of alternate foods have been encountered in any of the AWF Heartlands.

Provision of alternative water sources to wildlife species to reduce conflict with people is practiced in a few AWF Heartlands. In Kilimanjaro Heartland, AWF rehabilitated the water supply at Imbaringoi in 2004 to serve the livestock and people in the Kitirua Concession Area and prevent livestock from going to the Amboseli National Park in search of water. This has had the immediate effect of reducing encounters between livestock and wildlife in the Park and consequently reduced the level of conflicts in the area. With AWF co-financing, a water project was rehabilitated in the Archer's Post – Kalama area of Samburu Heartland in 2004 to supply water to community areas, to create separate drinking points for wildlife and livestock, and to help boost the tourism potential of the community areas. One of the project aims is to reduce competition between livestock and the endangered Grevy's zebra (*Equus grevyii*) for which the Samburu Heartland is a stronghold.

Landscape Management and Land-Use Modification

Human-wildlife conflicts can be reduced, perhaps in some cases totally prevented, by implementing changes to the natural resource that causes the conflict or to its surroundings. This can be achievable by altering the resource itself, the way it is managed, modifying the resource's habitat, or making changes to the surrounding landscape. This can include planting crops that are less palatable to wildlife, such as substituting chillies for maize (www.africanow.org), changing the timing when a crop is planted or harvested, altering animal husbandry practices to reduce risk of predation and designing and building predator-proof livestock *bomas* (stockades). Damage by wildlife can be reduced by making changes near the resource so that the problem wildlife is more vulnerable to predation, easier to spot by people and dogs, and generally less at ease in the area. For example, a livestock keeper can remove thick cover from near animal holding areas. Small islands of crops scattered across a wildlife inhabited landscape are more vulnerable to destruction than those that are clustered together. A landscape approach to reducing human-wildlife conflicts might therefore involve growing crops in large communal fields with straight edges, fences or thorny or spiny hedges, and also removing nearby cover and habitat for wildlife.

The long-term solution to human-wildlife conflict will often lie in better planning of land-use in problem areas. AWF has begun to address this issue through facilitation of landscape-level land-use planning. Participatory land-use planning and zoning exercises facilitated by AWF have been undertaken in several Heartlands. In Kilimanjaro Heartland, participatory natural resource management (NRM) planning has been undertaken for the Elerai and Kitirua Community Conservation Areas in Kenya and the Enduimet Wildlife Management Area in Tanzania. The Kitendeni Wildlife Movement Corridor, between the plains and Kilimanjaro Forest, has been secured with AWF support (www.awf.org). In Samburu Heartland, NRM planning has been undertaken for several community lands (see Kiyiapi 2003) and implementation of these plans is now progressing. Maasai Steppe Heartland's Manyara Ranch is a good example of AWF's success at securing a crucial habitat allowing wildlife to move between protected areas and thereby reducing the human-wildlife interface. Additionally, AWF-supported research in Maasai Steppe Heartland has contributed significantly to conservation measures. As a result, approximately 6,000 hectares has been zoned for conservation and the total conservation concession is now 13,500 hectares representing a significant portion of the elephant range in northern Lolkisale Game Control Area (Foley 2002).

AWF has declared securing such land for conservation as a primary focus of its conservation interventions in all Heartlands and implementation of this policy will help alleviate human-wildlife conflict. AWF is currently securing land for conservation through various mechanisms including formation of trusts, easements and direct purchases. In Kazungula Heartland, Zambia, AWF facilitated the development of community land trusts which will manage community lands in addition to mitigating human-wildlife conflicts.

Mitigation Approaches

Although prevention is clearly the best option, at times reactive approaches are required after human-wildlife conflicts have occurred. The main approach under this heading is Problem Animal Control (PAC), most often undertaken by the national wildlife authority. The 'problem animal' can either be killed or captured for translocation.

Lethal PAC

In lethal control it is obviously desirable to focus on those individuals actually causing the problem (the culprits) or at least to target the group of animals whose home range includes the site where the problem is occurring. In reality, often the problem animal is not identified, but rather any individual is killed to satisfy the demand for action and revenge by the aggrieved community – especially in the case of loss of human life or the killing of livestock. In such a situation the action by the wildlife authority rangers may have public relations value but in all probability the culprit will survive and continue to inflict damage. The author is aware of some initial attempts to identify 'problem-elephants' in Kilimanjaro Heartland during the 1997 dry season in a collaborative effort between AWF, Kenya Wildlife Service and the Amboseli Elephant Research Project. However the success of the programme was not assessed and elephants killed during PAC interventions may or may not have been the culprits. Generally, shooting a problem animal is believed to be the best way to show the others to stay away, but it is often difficult for wildlife managers to obtain permission to shoot an animal quickly, thus making killing the culprit virtually impossible. Problem Animal Control is especially difficult when endangered species are implicated – in that case translocation may be a preferable option.lyal. method used in PAC is disturbance shooting (firing shots over raiding wildlife species) but this becomes ineffective

Translocation

Translocation has been used to remove individual animals responsible for depredations and also, in some cases, to reduce populations in specific areas by removing relatively large numbers of animals. Translocation can be an appealing method to the general public, especially those who are particularly concerned about animal welfare, as they perceive that it gives the affected animal a second chance at a new site. Unfortunately the reality is often not so positive and translocation can be a controversial means of resolving human-wildlife conflicts, associated with a number of problems (for examples see Conover 2002). It is quite common for translocated animals to return to the site from where they were originally captured. In Kilimanjaro Heartland, a leopard was trapped and moved several times into Amboseli National Park before finally being shot by the authorities after it became a habitual livestock killer in the nearby Kimana area (personal observation).Following translocation, immigration of new animals may occur to take advantage of empty territories, so that the problem can persist. The translocated animals can also recreate the same problem at their release site. Translocation is also a risky procedure and it is normal for a proportion of translocated animals to die either due to the stress of capture, or soon after release. Translocated individuals can also endanger a resident population through introduction of disease or they may destabilise a population through increased competition for territory or food. Translocated animals have also been shown to have lower than usual reproductive and survival rates (Conover 2002).

For species such as large carnivores and elephants there needs to be a large area, up to hundreds or thousands of square kilometres, without potential for conflict with people, where the individuals can be released for the strategy to work (Stander 1990). If no such areas exist, management efforts should concentrate on reducing potential conflict, and if this is not practical, the only option left is lethal control for repeat offenders. The cost-effectiveness of translocation has also been questioned but this option is probably warranted if the species concerned has a high conservation value, it contributes towards the success of a re-introduction programme, or if public concerns outweigh other considerations.

Wildlife translocation to resolve conflicts has been practiced in AWF Heartlands to varying extents but there is very little documentation of whether or not

conflict was reduced and conservation goals achieved, and the fate of translocated individuals is often unknown. Several elephants were moved from Sweetwaters Sanctuary in the Samburu Heartland to Meru National Park following increased levels of conflict with neighbouring farmers in the late 1990s. While the conflicts were presumably reduced, the translocated elephants did not do well at first and, unfortunately, monitoring was terminated after only one year for lack of resources and so the ultimate fate of the animals is unknown.

Winning Hearts and Minds

The third approach to dealing with human-wildlife conflict involves changing the attitude of affected communities through education, consolation payments and broader sharing of benefits associated with the presence of wildlife.

Compensation and Benefit Sharing

An approach popular with communities adversely affected by wild animals is payment of compensation in the event of loss. This approach is usually confined to a specific class of loss, for example livestock killed by elephants or predators. The schemes are often funded by a conservation organisation, although government schemes also exist. All are designed to prevent the affected communities taking direct action themselves, which would have usually involved hunting down and killing the individual elephants, lions or other species involved. Although compensation schemes meet the demand of local people to be financially compensated for the loss, they have their own problems. They are difficult to manage, requiring for example reliable and mobile personnel on the ground to verify claims. They can also be expensive. In the case of a pilot compensation scheme introduced by a voluntary conservation group, Friends of Nairobi National Park, to compensate Maasai livestock owners in the event of predation by the Park's lions, leopards or cheetah, the scheme proved too expensive to continue. A similar privately funded scheme operating in Amboseli National Park to compensate Maasai herders in the event that elephant kill livestock, for example at water holes during the dry season, has proved to be more affordable and sustainable because such occurrences are relatively rare.

Rather than relying on funding from voluntary organisations, an alternative approach to financing compensation schemes is through insurance policies, where farmers pay a premium for cover against a defined risk, such as predation of livestock. The premium could be set at the true market rate or be subject to subsidy provided by conservation organisations. This is the approach currently being explored in the case of livestock predation adjacent to Nairobi National Park, and in principle insurance policies could be developed to cover a wide range of wildlife-related risks.

Compensation schemes provide redress following damage inflicted on local communities by wild animals, but a broader approach entails providing tangible benefits to land owners in recognition of the role they play in, and costs associated with, hosting wildlife on their land. A pilot programme has been operating for some years for landowners adjacent to Nairobi National Park and has proved popular with landowners. However, the approach is expensive and requires funds to be made available year after year. The intention in the Nairobi National Park pilot was to raise funds to establish an endowment which could then sustain the programme, but to date the necessary funds have not been secured.

The Kenya Wildlife Service has a programme of sharing revenue generated from national parks with neighbouring communities. The funds provided are directed at community level benefits, such as class rooms for schools and cattle dips. Although such amenities are appreciated by the communities concerned, community level benefits do not compensate for individual losses, such as predation of livestock or destruction of crops. It is open to question whether such revenue sharing programmes affect attitudes of affected communities to co-existence with wildlife. More generally, key questions asked about compensation schemes include whether or not they: help wildlife species in conflict with humans, are based on concrete information to be applied effectively, pay the appropriate amount of compensation, target the right culprits, and are fair, timely, transparent and sustainable. The cost of running a compensation scheme varies widely (Nyhus *et al.* 2003).

AWF has been instrumental in helping communities in key wildlife habitats to acquire donor funding to finance the development of eco-lodges on their land. The idea is that this diversifies their livelihood base and provides a direct benefit linked to the presence of wildlife on their land. Such an eco-lodge is close to completion at Elerai in the Kilimanjaro Heartland.

The Need for Policy Harmonisation

In many cases critical wildlife ecosystems straddle national boundaries and where policies and approaches to dealing with human-wildlife conflict vary on either side of the border this can present a problem. For instance, in the Chobe-Caprivi corridor area communities are largely subsistence farmers and livestock keepers with approximately 20,000 people on the Botswana side and 120,000 on the Namibian side. Occurrence of human-wildlife conflict, especially due to lions and elephants is high. Botswana offers compensation for crop and livestock damage but Namibia does not and Namibia has a system of using community game guards for conflict mitigation while Botswana relies on protected area authorities.

As part of the Four-Corners Transboundary Natural Resource Management Project, AWF awarded a sub-grant to CARACAL, a Botswana based NGO, to investigate Botswana-Namibia transboundary wildlife movements and human-wildlife conflicts in the Chobe-Caprivi corridor and to develop management partnerships to work towards securing and management of the Chobe-Caprivi corridor. CARACAL conducted socio-economic surveys in order to understand the nature of the problem and identify which strategies would be useful for mitigation. Results showed that there is gender disparity in how people are affected by wildlife conflict and this is linked to ownership of resources. Men tend to view the lion as the most problematic animal because men mostly own livestock, which are prime targets for the lions. Livestock also receives the highest compensation in Botswana. On the other hand women, who are mostly agriculturalists, rank the elephant as the most problematic animal because of crop raiding. Female-headed households are most affected by wildlife conflict with over 85% reporting damage to crops and 95% impacts on livestock. This is because in most cases such households are relatively poor and unable to invest in mitigation measures such as building strong fences and animal kraals.

These results have provided a good understanding of the traditional patterns of conflict, the key problems involved and how they are affecting livelihoods, especially of the most vulnerable in society. At the close of the project, CARACAL was working with the communities to develop gender based mitigation options for implementation using an innovative method employing participatory Geographic Information Systems. Maps have been developed using local landmarks and features and these are being used to delineate the migration corridor used by wildlife and to develop options with communities for wildlife conflict mitigation. One of the key options under discussion was securing the Chobe-Caprivi corridor for movement of wildlife so that problem animals do not affect communities as they move across the landscape. CARACAL and AWF also plan to organize a workshop to present the findings and propose harmonization of policy on human-wildlife conflict to the governments of Botswana and Namibia.

Lessons Learnt and Ways Forward for AWF

The goal of human-wildlife conflict alleviation is to create landscapes (Heartlands) where people and wildlife can co-exist and have as little negative impact on each other as possible. Although each human-wildlife conflict situation is unique, some general lessons can be learned for the Heartlands:

Integrate Human-Wildlife Conflict Management into Wider Conservation Objectives

Managing human-wildlife conflict should be part of the larger conservation and development objectives for species' wellbeing and peoples' livelihoods. It should be integrated within the management objectives of different wildlife management strategies such as law enforcement, effects on habitats and biodiversity, and benefits accruing from wildlife use. An important area of human-wildlife conflict that AWF has little been involved in is the social-economic dimension. A good understanding of the economic and social costs (and opportunities) of living with wildlife will go a long way towards alleviating the problem.

Understand, Monitor and Evaluate the Problem

A key step in enhancing AWF's ability to mitigate human-wildlife conflict is for the respective AWF teams to gain better understanding of the problem in their respective Heartlands. It is essential to have accurate information about when and where the conflict is occurring. This understanding, concurrent with implementation of appropriate measures, should lead to a better focus on target areas and the most relevant species within a Heartland. Simple monitoring and evaluation schemes exist which can be adapted to local circumstances and information gathered can be used to draw up a strategy to combat the problem. Preventive measures will be most effective in the long-term.

The results of each wildlife problem management initiative should be monitored to determine how effective it is for the people and wildlife concerned. It is also important to understand what undesired impacts might arise from any mitigation measures. For example, while fences can effectively resolve human-wildlife conflict, are they also a threat to conservation by impeding movement and access to resources by wildlife in the Heartlands? It should be possible to find optimal ways of using barriers to achieve both the objectives of conflict mitigation *and* landscape-scale conservation.

Research Prioritization

Priority areas for human-wildlife conflict include focus on community-level response to collective management of risk, and how benefits from conservation can be linked to conflict mitigation measures. Research on human-wildlife conflicts should address the question of what mitigation measures work and under what circumstances. Methods that can be replicated across Heartlands and sites will be useful to develop.

Sharing Information

Results of past research (Sitati *et al.* 2003) suggest that spatial correlates of conflict can be identified, and areas of vulnerability mapped, to enable the development and deployment of appropriate conflict mitigation measures. AWF has the capacity to use spatially explicit GIS analyses and maps to document distribution and type of conflict, species involved, severity, causal factors of conflict and to produce predictor variables for conflict. Such information will be useful to local farmers, who often feel powerless to combat the problem, and also the authorities who want to help but have inadequate information to inform targeted prompt action.

Work with the Affected Local Community

Wildlife damage management is a human management issue. There is need for local solutions to these local problems in which risk is individualized. In Kilimanjaro Heartland, the AWF-facilitated Conflict Resolution Committee comprising representatives of government departments, local communities and the private sector is helping alleviate conflict. A consolation scheme was considered necessary due to the high incidence of spearing by local Maasai and its aim is to prevent the killing of elephants. It was successful because landowners were an essential element in its planning and implementation. Communities must be active participants in any conflict mitigation measure designed to help them. Flaws in sustainable use of exclusionary wildlife barriers emanate from lack of maintenance and problems with communal ownership, valuable materials being stolen or used for snaring, and most farmers being unable to afford such wildlife barriers.

Wildlife species generally attack livestock and crops that are poorly defended; wildlife damage is closely correlated to the effectiveness of the defences. Being aware of the presence of wildlife through vigilance and cooperation between landowners is a key component toward improving the effectiveness of control measures.

Land-use plans are rarely implemented at large-scales in Africa, but the local level can be useful to develop and implement land-use plans to reduce losses to wildlife. On the micro-scale, for instance, the positioning of fields in relation to elephant movements may be easier to implement than district wide schemes.

Build upon Existing Initiatives

It is recommended that AWF prioritizes researching solutions above researching the human-wildlife problem *per se*. Current initiatives should build upon past efforts like the Human-Elephant Conflict Decision Support System protocol developed by African Elephant Specialist Group (Hoare 2002) and several efforts developed for predators (see Conservation Biology, December 2003).

Draw up a Strategy

It is suggested that a long-term strategy to mitigate human-wildlife conflict is developed for each AWF Heartland as the problem is likely to be recurrent. There is need to build capacity targeted to this issue. Progress was being made in Kilimanjaro and Samburu Heartlands where KWS helped set up several wildlife fences with the help of donors. These barriers face the problem of maintenance once donor funds have gone, an issue that AWF is being called upon to assist with, e.g. in the case of the Kimana fence built with World Bank funds. A strategy to alleviate human-wildlife conflict in an AWF Heartland should, of necessity, be multidisciplinary and developed with the full participation of key stakeholders.

Strengthen Local and National Institutions

There is need to strengthen both national and local wildlife authorities in the manner in which they deal with human-wildlife conflict. In Kenya, the wildlife authority's main way of resolving conflicts is through Problem Animal Control – basically a reactive way involving killing one or more individuals of the species during times of crisis.

Where the government authorities are relatively weak in managing human-wildlife conflict, NGOs are often perceived to be *de facto* the management authority. But AWF should be wary of taking on too much responsibility in human-wildlife conflict mitigation.

Develop Clear Policies to Enhance Human-Wildlife Conflict Mitigation

In several countries where AWF works, the policies regarding wildlife management and conservation are unclear regarding the management of human-wildlife conflicts; some countries have no official policies in this area. Regarding elephants, Hoare (2000) noted that this translates into lack of pro-active policy on tackling the matter and budgeting for its costs in six out of seven countries studied.

Engage TBNRM Approach as Appropriate

Several AWF Heartlands extend across national boundaries and human-wildlife conflict mitigation measures need to be managed within a transboundary natural resource management framework. AWF has the potential to improve upon development of joint wildlife problem management in its transboundary Heartlands. In Kazungula Heartland, Botswana has a compensation policy but not Namibia, yet elephants and carnivores cause problems on both sides of the border.

What Works Well to Alleviate Human-Wildlife Conflicts?

There are no panaceas in the management of wildlife damage. But well-designed human-wildlife conflict management plans which integrate different techniques and are adjusted based on the nature of the problem can boost co-existence. It is prudent to practice the long-term policy options of managing the problem animal element of a population *in situ*. It is recommended that AWF elevates its actions toward human-wildlife conflict mitigation in the Heartlands. Potential solutions should be considered and selected based on their effectiveness, cost and human and social acceptability. Reducing conflicts between wildlife and people is likely to reduce the negative attitudes that many communities have towards wildlife and conservation. Improving food security by reducing wildlife related impacts on crops and livestock will also reduce the need to seek alternative sources of food, such as hunting of wildlife. Finally, it is apparent that mitigation measures used in eastern and central Africa often differ significantly from those practiced in southern Africa.

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