

Wildlife Conservation Outside Protected Areas — Lessons from an Experiment in Zambia

DALE LEWIS

Nyamaluma Conservation and Training Center
P.O. Box 82
Mfuwe, Zambia

GILSON B. KAWECHE

National Parks and Wildlife Service
Private Bag 1
Chilanga, Zambia

ACKIM MWENYA

National Parks and Wildlife Service
Private Bag 1
Chilanga, Zambia

Abstract: *Managing an area as a national park in Africa often entails dealing with human pressures from regions surrounding the protected area. Dealing with these human pressures is the subject of this paper, which goes well beyond mere law enforcement to discuss the realm of traditional leadership in the village, rural socioeconomics, and the services of wildlife management by government in areas surrounding a national park.*

This paper describes the results of an experimental project in Zambia that sought to halt the drastic loss of elephants and rhinos to poaching in and around protected areas in the Luangwa Valley. The design of this project was to involve local residents outside national parks in wildlife protection and management activities. In addition, sustained-yield uses of wildlife were adopted to recycle revenue shares into community development and to make the program of wildlife management financially self-supporting.

To help carry out the various tasks of protecting and developing wildlife resources, residents were trained and employed as wildlife management staff. Village wildlife councils provided advice and assistance. Safari concessions yielded sufficient revenue to meet the recurrent costs of wildlife management and also generated significant earnings for local community benefits. As a result, poaching dropped dramatically, local economies were improved, and village attitudes toward wildlife management and conservation became more positive.

Resumen: *En África, el manejo de un área natural como parque nacional implica, usualmente, lidiar con las presiones humanas existentes alrededor del área protegida. Ese es el tema de este documento, el cual va más allá de la mera aplicación de las leyes, para considerar el ámbito del liderazgo tradicional en la aldea, la socioeconomía rural y, los servicios gubernamentales de manejo de fauna en áreas que rodean un parque nacional.*

Este documento describe los resultados de un proyecto experimental realizado en Zambia, cuyo objetivo era detener la perdida drástica de rinocerontes y elefantes causada por la cacería ilegal en áreas protegidas y en sus alrededores, específicamente, en el Valle Luangwa. El diseño de este proyecto consistió en involucrar a la población local, residente fuera del parque, en actividades de protección y manejo de fauna silvestre. Además, se adoptó el uso sostenido de la fauna silvestre, como fuente de ingresos para coadyuvar en el desarrollo comunitario, convirtiéndolo, además, en un programa financieramente autosuficiente.

A fin de realizar las diversas tareas de protección y desarrollo de los recursos de fauna silvestre, se capacitó y empleó a residentes locales como personal encargado del manejo de la fauna silvestre. Los Concejos de Fauna Silvestre de la aldea proporcionaron asesoría y colaboración. Las concesiones para el desarrollo de safaris generaron suficientes fondos para cubrir los gastos recurrentes de manejo de fauna silvestre y también generaron ganancias significativas en beneficio de la comunidad. Como resultado de estas actividades, se redujo la cacería ilegal, mejoró la economía local, y la actitud del pueblo hacia la conservación y el manejo de fauna se tornó más positiva.

Introduction

Over the past decade wildlife populations in Africa have declined drastically throughout much of their former range. This trend has occurred despite attempts to improve law enforcement and supply badly needed field equipment. While the search for more lasting, effective solutions to wildlife conservation in Africa continues, there is a growing consensus that part of the solution will require greater involvement by residents living near wildlife resources to both manage and benefit from the sustainable development of these resources. Ironically, this approach conforms to customs of traditional African societies. Prins (1980) and Marks (1976) argue that these customs were ecologically adaptive and rigidly followed under societal traditions.

Modern-day Africa has introduced new rules and authorities for governing land use, and this has tended to weaken and sometimes even eliminate traditional authorities (Roberts 1973; Bond 1976; Willis 1985). Wildlife conservation has not been exempt from such government-regulated changes, which to a large extent were inherited by postcolonial governments. One important consequence of such government intervention is the reduced level of ownership by rural residents of their wildlife resources (Marks 1976).

If any lesson can be learned from past failures of conservation in Africa, it is that conservation implemented solely by government for the assumed benefit of its people will probably have limited success, especially in countries with weakened economies. Instead, conservation for the people and by the people with a largely service and supervisory role delegated to government authorities could foster a more cooperative relationship between government and the residents living with the resource. This might reduce the costs of law enforcement and increase revenues available to other aspects of wildlife management, which could help support the needs of conservation as well as those of the immediate community. Such an approach would have the added advantage of restoring to local residents a greater sense of traditional ownership and responsibility for this resource. Convincing proof that such a partnership is possible has yet to be demonstrated and has therefore been more theoretical than pragmatic.

This paper examines how this form of partnership reduced potential conflicts between villagers and wildlife in one experimental project. Its objective was to help financially support both community improvements and wildlife conservation through sustained-yield uses of this resource with the involvement of local villages in an area outside South Luangwa National Park, Zambia.

The results of this experiment fell into four broad categories: (1) rate of illegal off-take of wildlife, (2) sustainability of economic incentives for local residents to support sustained-yield management of this resource,

(3) attitude and perceptual changes by residents toward wildlife issues, and (4) level of manpower and leadership derived from the village community to properly manage wildlife resources. From these results we derived a cost-benefit analysis to compare the methods adopted in this experiment with more conventional approaches of wildlife management used elsewhere in Africa.

Description of Study Area, Village-Wildlife Conflicts, and Village Socioeconomics

The Luangwa Valley supports a world-acclaimed diversity and abundance of wildlife, the greatest concentrations occurring along the alluvial belt of the Luangwa River. Its four national parks account for approximately 20 percent of the Luangwa Valley catchment. Surrounding these parks are game management areas more than three times as large as the parks themselves (see Fig. 1).

These game management areas differ from parks in that they are zoned for wildlife utilization, mainly hunting, and also allow human residency. In both zones, however, wildlife is constitutionally the property of the state, and hunting in game management areas requires licenses that are often prohibitively expensive to residents. This denial of access to protein resources undoubtedly arouses negative sentiments among local residents toward government wildlife policies. Such

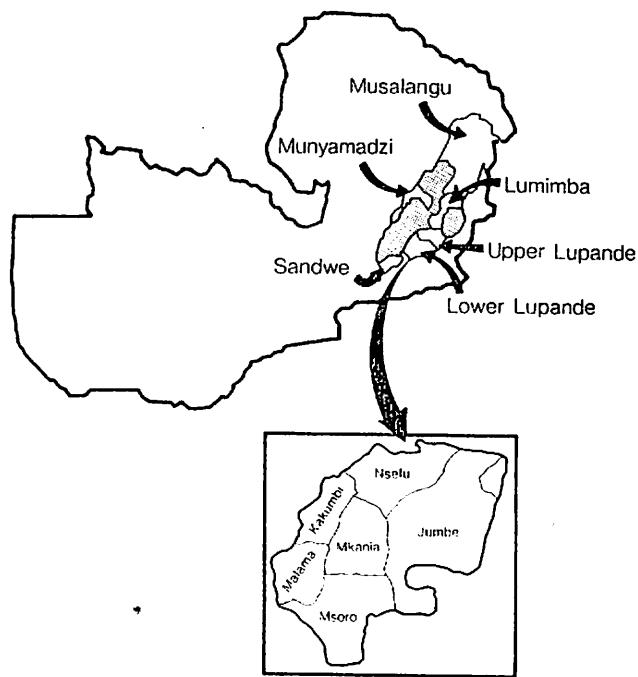


Figure 1. National map of Zambia showing the six game management areas surrounding the national parks (shaded). The enlarged inset is Lower Lupande Game Management Area with its six Kunda chiefdoms.

conflicts have been well recognized in previous work (Lewis & Kaweche 1984) and have contributed to the drastic decline of both elephants and black rhinos in the Luangwa Valley (Lewis 1986; Leder-Williams 1985).

A total of five distinct tribes with their own respective chiefdoms live in the Luangwa Valley. Located to the east of South Luangwa National Park is the Lupande Game Management Area (see Fig. 1). With a total land area of 4,849 km², Lupande is occupied by six separate chiefdoms of the Kunda tribe with a total population of approximately 20,000. This study was carried out principally in one of these chiefdoms, Malama, and to a lesser extent in the Chief Kakumbi and Chief Msoro areas. Chief Malama's area, totaling approximately 400 km², is the most remote of the six Kunda chiefdoms. It is also the least populated, with about 700 people distributed in village settlements that occupy about 5 percent of the total Malama land area. These settlements are located principally along alluvial drainages where subsistence farming and some cash farming are practiced.

Prior to this study, a socioeconomic survey was conducted in the Malama, Msoro, and Kakumbi areas to establish a baseline description of revenue sources generated from within the respective areas (Atkins 1984). The results showed a rural economy based largely on agriculture, although only 3 to 7 percent of the total land area is arable (Dalal-Clayton et al. 1984). The largest single revenue earner was international safari hunting, which grossed approximately US \$350,000 per year for the whole of Lupande. Ironically, less than 1 percent of the safari hunting revenue was returned to support local village economies (Atkins 1984) and a negligible amount was turned to wildlife management costs (Lewis, personal observation). Predictably, local attitudes toward safari hunting were negative.

During much of the 1970s and early 1980s, illegal hunting of wildlife, especially elephants and rhinos, reached unprecedented levels, with a 6 to 8 percent annual decrease for elephants (Lewis 1986). The Zambian government intensified law enforcement with better equipped wildlife scouts, who were government civil servants. These scouts were not members of the local community and their presence near villages was generally unwelcome. In Malama's chiefdom, more than half of the respondents in Atkins's survey (1984) expressed negative attitudes toward Zambia's National Parks and Wildlife Service (NPWS), which in their view favored the hunting privileges of foreign hunters more than local residents. As a result, poachers entering their area from more distant places were encouraged to hunt illegally as long as they shared some of the meat. The role of the NPWS government department in Lupande Game Management Area was therefore frequently contested and criticized by local residents, as is reflected in a statement in an address given by Chief Malama (1984): "Tourists come here to enjoy the lodges and to view

wildlife. Safari companies come here to kill animals and make money. We are forgotten . . . Employment here is too low. Luamfwa Lodge employs only about four people and safari hunting employs no one. How can you ask us to cooperate with conservation when this is so?"

Methods

Experimental Design

In response to these problems, an experimental design for managing wildlife was adopted by the NPWS and tested in the lower half of the Lupande Game Management Area. It was called the Lupande Development Project. The design was based on the critical premise that a share of wildlife revenues be retained by NPWS to support the management needs of this department for the area where the funds were generated. A financial institution within NPWS, the Wildlife Conservation Revolving Fund (WCRF), was created for this purpose in 1983. A second premise of this design is that NPWS be allowed to employ additional staff beyond the government-approved quota of civil servants.

The initial design of the proposed GMA structure called for a wildlife management approach in which (1) manpower requirements were drawn from the local village community, (2) manpower training and development was supervised by NPWS to ensure a high standard, (3) issues of wildlife management were dealt with in collaboration with village leaders through wildlife subcommittees for each chiefdom, (4) administration of proposed new GMA structure was charged to a NPWS officer, called a unit leader, and (5) revenue generated by the WCRF from within Lower Lupande was retained to support both wildlife management costs and local community benefits.

To develop a reliable and adequate work force for wildlife management, men from the ages of 20 to 35 who resided in local villages were chosen for training under NPWS personnel in such skills as law enforcement, wildlife censusing, data collecting, and report writing. After a minimum of six months training, these recruits were designated village scouts officially employed by NPWS as non-civil servants. They were employed year-round, and they remained in their respective chiefdoms as the local "custodians" of their wildlife resources. The unit leader supervised and monitored their work. On a seasonal basis, additional workers were also recruited from the local community to assist with other management needs of the area. A crew of brickmakers, masons, and carpenters was recruited as a building maintenance team. Supervised by the unit leader, they provided the work force for constructing residences for the village scouts at remote stations in Lupande.

The management design also provided for critical in-

put from village leaders on existing wildlife programs and on the planning of future ones. Initially, this took the form of direct talks with the local chief in the company of an unspecified number of village elders or headmen. Within the course of a year, however, local village leaders themselves recommended that a village wildlife committee, composed of all the headmen, the chief, and appropriate NPWS officials, including the unit leader, be formed to discuss issues of wildlife. Under the joint chairmanship of the unit leader and the chief, this approach was adopted.

Of critical significance to the design is the earning and handling of wildlife revenues. Two sources of revenues were identified for this project: wildlife safari hunting and sustained-yield harvesting of hippos. Revenue from the former was based on a public auction in which safari hunting companies made private bids for the right to hunt in this area, which would be managed and policed through the joint participation of NPWS and the local community. The highest bid was accepted as a concession fee, and 40 percent was handed over by WCRF to the local Kunda chiefs for community projects, 60 percent being recycled back into the GMA for meeting wildlife management costs.

Another source of revenue was from the sustained-yield harvest of hippos and the commercial marketing of their teeth, hides, and meat. The net profit from this program was shared in the same proportions as described above between the local community and NPWS, which used its share for wildlife management costs in Lupande. The methodologies adopted for this harvesting program were labor-intensive to maximize employment opportunities for local residents in Malama area.

This design assumed that awareness and understanding of wildlife management by local residents would increase as revenue benefits to the community increased and village participation in the program expanded. The design encouraged a greater administrative role in wildlife management by local authorities under the guidance and supervision of the unit leader. In this way, cost-effective solutions to wildlife management problems that might require local inputs of ideas and participation would be more forthcoming, and would help diversify the sources and overall amount of wildlife revenue in the game management areas.

Testing the Design

The test of the design was based on measured responses evaluated before and after implementation. The following data were assessed: illegal killing of animals in Lower Lupande, local attitudes toward wildlife conservation, revenue earnings from wildlife resources, and the allocation of these earnings toward community development and wildlife management costs. These data were collected from 1985, the year preceding the Lupande

Development Project, through 1987. Since one objective of this experimental design was to reduce the poaching (or illegal killing) of elephants and black rhinos, these two species were used as indicators of overall trends in poaching in Lower Lupande.

Various measures of law enforcement were assessed to relate them to any changes in poaching rates. One was total number of field officers active in the study area and the other was man-days, the total number of 24-hour days of patrolling for a given law enforcement operation times the total number of people who were on patrol. The assessment of law enforcement effort was also related to area, since the density of enforcement personnel might be more important than just total number of personnel. To determine the area patrolled, field staff indicated on a map the area traversed during their field operations.

Assessing local attitudes toward conservation involved several indirect indicators: attitudes and views expressed at public forums, frequency of information volunteered by local residents in assisting with arrests of illegal hunters, and the incidence of volunteer participation in matters affecting wildlife conservation. A more direct method was used toward the end of the study period. In November 1987, 30 adult male respondents were randomly selected in Malama chiefdom to answer a set of questions designed to evaluate local community perceptions of the various programs implemented in this management design and whether local attitudes toward NPWS had become more favorable as a result. This questionnaire survey was carried out by a team of agricultural enumerators who were nonresidents and were unrelated to the Lupande Development Project. The respondents were told the survey was part of the routine work of the Department of Agriculture; for this reason, questions of crop damage by wildlife were included. This was done so that respondents would not link the questionnaire to the Lupande Development Project and feel obliged to answer in a biased way.

Revenue earnings were made fully accountable through the WCRF for earnings from safari hunting concessions and hippo culling. Allocation of these funds to the local community was determined by the agreed percentage of net revenues that went directly to the Kunda chiefs from the WCRF. Through their own forum for deciding how these funds should be spent, the chiefs then allocated these revenues to community projects.

Results

Wildlife Management: Effort and Results

In 1985 effective law enforcement within the designated area of this experimental management program was limited to only 200 km². Five civil servant wildlife scouts and six village scout trainees were allocated to

this area, and they conducted law enforcement operations only when gunshots of suspected illegal hunters were heard. These personnel were deployed from a single camp. In the surrounding area effective law enforcement was nil. In 1986 the recruitment of wildlife management personnel from the local community as village scouts intensified. By the second half of 1986 a total work force of 18 policed an area of approximately 275 km². With continued recruiting and training of village scouts, the number of field staff reached 26 by August 1987, and the total area of surveillance was approximately 400 km². Of this area, 30 percent overlapped inside the South Luangwa National Park.

Prior to the village scout program, a work force comprised almost exclusively of civil servants policed the area. The increase in manpower from 11 to 26 between 1985 and 1987 resulted from recruitment of local residents as village scouts. From November 86 to July 87, total man-days of field operations for civil servants and village scouts revealed a disproportionately greater effort by village scouts to patrol and conduct field operations than by civil servant scouts. This difference was 717 versus 176 man-days, respectively. Contributing to this discrepancy was the higher rate of absenteeism among civil servants, who left their stations for supplies, medical assistance, or collection of salaries. With village scouts, salaries were paid directly by the unit leader and visits away from their stations were normally for short-duration trips to their villages, which were near their camps.

Based on their relatively high man-day effort, village scouts' contribution to law enforcement accounted for much of the increase in number of arrests and firearms seized during the period of 1985 to 1987 (see Fig. 2). Consistent with these trends in law enforcement was

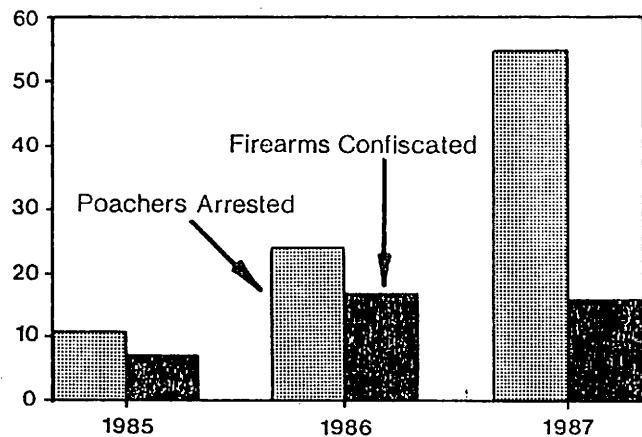


Figure 2. Results of law enforcement effort from 1985 to 1987. Shaded bars indicate total number of illegal hunters arrested and solid bars give total firearms confiscated during law enforcement operations for each year.

the downward trend in poaching mortality for both elephants and black rhinos. Annual mortality from the illegal hunting of these two species, expressed as number of poached carcasses found per year per km², decreased at least tenfold from 1985 to 1987.

In addition to law enforcement, other important functions of wildlife management were carried out by village scouts in the experimental program under the supervision of unit leaders. For instance, village scouts accompanied safari hunters and their clients throughout the hunting season to fill out daily data sheets for evaluating hunting effort and trophy yields and to record information on wildlife numbers in the areas hunted. Additional duties included controlled early burning in May and animal counts along fixed transects during September. Village scouts' particular skills useful for wildlife management were also developed in this program; these skills included vehicle maintenance, typing, and driving.

Wildlife Earnings and Allocation of Revenue to Wildlife Conservation

Revenue

A key focus of this study was whether conservation costs for the program area could be annually balanced from wildlife revenue earned by WCRF from the same area. Five sources of revenue, excluding profits to the private sector, resulted from this experimental program: safari hunting concession fees, safari hunting licenses, collection of ivory, fines from court convictions for illegal hunting, and sales from hippo harvest. These revenues were shared among those entities with a political influence on wildlife conservation (i.e., the Central Treasury) as well as with the resident community participating in this program. Table 1 shows the complete breakdown and intended destination of the total earnings for 1987, which equalled K 694,574. The total amount allocated specifically for wildlife management under the Lupande Development Project was K 212,067, as derived from safari hunting and a projected income from hippo culling. A reduced hippo harvest in 1987 caused by an anthrax epidemic lowered the actual revenue allocated to wildlife management for Lower Lupande in 1987 to K 146,000 (see Table 1). This amount was earned from less than 25 percent of the total area of Lower Lupande, although the remaining area has the potential to become another safari hunting concession block if former wildlife numbers are restored.

Wildlife Management Costs

To determine the affordability of this management program, expenditures on all activities included in this experimental program were monitored for 1987 and balanced against revenue earned to pay for these management costs. Six categories were used to describe

Table 1. A breakdown of revenue earnings from wildlife in Lower Lupande GMA excluding those from the private sector. Indicated also are the destinations of these funds.

Category	Destination	Revenue
Safari hunting concession fee	Wildlife management costs	K 146,000
	Local community projects	97,400
		Total: 243,400
Safari hunting license fees	Central Treasury	289,040
Elephant ivory	NPWS Revolving Fund	18,200
Hippo utilization	Wildlife management costs	65,667
	Local community projects	65,667
		Total: 438,574
Fines from arrested poachers	Central Treasury	(approx.) 12,000
		Total revenue: K 693,974

the recurrent costs of this program: village scouts, housing construction and camp improvements, office supplies, vehicle maintenance, public relations, and capital replacement costs. The recurrent cost for implementing the village scout program was K 63,685, which exceeded all other management costs (see Table 2) and covered salaries, uniforms, ammunition, etc. In addition to the village scouts, building and camp improvement projects required a major fraction of the total budgets allocated to employment. In accordance with the design of this management program, only local residents were considered for employment. The total revenue spent on

salaries for these two projects for 1987 was K 50,747, or 60 percent of their combined total budget (see Table 2). Total revenue directed to the local community as salaries from all wildlife activities in this management program equaled K 70,212 (see Table 3).

Overall recurrent costs for 1987 equaled K 141,212, which was below the realized revenue for wildlife management costs for that year. The positive balance was only 4 percent of the total revenue, not enough to expand this management program to unaffected areas elsewhere in Lower Lupande. This underlined the importance of the potential revenue expected from the

Table 2. Recurrent wildlife management costs from November 86 to October 87 in the project area.

Category	Items	Total expenditure	Summary
Village Scout Program	Salaries & bonuses	Z K 41,200	
	Rations for patrols	1,165	
	Operational expenses (fuel, ammunition)	14,765	
	Additional requirements (boots, uniforms, etc.)	<u>6,555</u>	
			Z K 63,685
Building construction & camp improvements	Salaries	9,547	
	Materials	8,142	
	Rations	890	
	Transport	<u>2,150</u>	
			20,729
Office supplies			2,993
Vehicle and other equipment maintenance	Repairs	12,820	
	Spares	13,485	
	Oils & grease	<u>4,000</u>	
			30,305
Public relations	Display boards	1,400	
	Wildlife subcommittee	<u>2,100</u>	
Per annum depreciation costs on capital items			3,500
			20,000
			Total recurrent costs: Z K 141,212

Table 3. Employment records from November 86 to October 87 showing number of people employed for particular job categories, salaries paid out, and the source of employment.

Category	Total number employed	Total salaries paid out	Source of employment
Building projects	20	Z K 11,715	NPWS Revolving Fund
Safari hunting	46	10,897	Safari company
Village scouts	16	41,200	NPWS Revolving Fund
Village scout trainees	12	3,200	NPWS Revolving Fund
Hippo utilization	20	3,200	NPWS Revolving Fund
Totals:	114	Z K 70,212	

sustained-yield harvesting of hippopotomi as a way to diversify and increase revenue from Lupande. Funds from overseas conservation grants were used for capital equipment purchases, which equaled K 181,240. These capital purchases were special-case purchases; they were not necessary to implement the wildlife management program but were required to help monitor the wildlife development of this area to relate it to other game management areas.

Attitude Changes Among Local Residents

Earlier work (Lewis, unpublished data; Atkins 1984) revealed that the majority of local residents in the area to be affected by this project had negative sentiments toward NPWS. Many residents felt this department served the needs of tourists and safari hunters and even the resource itself, more than it served the needs of local residents. The people interviewed in these earlier studies had little appreciation of the level of legal benefits wildlife could bring into their area.

The role of research in trying to better manage and develop wildlife resources was seen as a ploy to convert lands being used by villagers into another national park. Local residents held strong traditional feelings of authority over their lands and challenged the role of NPWS in advising local villagers on how to manage their wildlife resources.

It appeared that socioeconomic factors contributed to these strong sentiments, since the most common means available to local residents to profit directly from wildlife was illegal hunting and existing low levels of income made such practices a question of survival for some residents. The solution adopted by this program was to employ local residents in the wildlife management effort on a permanent and seasonal basis and to provide a significant share of the wildlife revenue to the Kunda chiefs in Lupande Game Management Area. As stated earlier, local employment in 1987 was Z K 70,212. Employment from safari hunting is included in this figure because such employment was a condition of the terms for the safari company to hunt in Lower Lupande. In 1986 a relatively short hunting season was concessioned to a safari hunting company in Lower Lu-

pande for Z K 159,000. Based on the revenue-sharing formula, 40 percent of these funds went directly to the local chiefs. In early 1987 a total of Z K 63,600 was made available to the Kunda chiefs in Lupande for sponsoring community projects.

In December 1986 the first wildlife subcommittee for Chief Malama's area was convened and a review of the wildlife management program was presented to the committee members. Unlike earlier meetings between local leaders and National Park staff in Malama area, this meeting ended with an audience convinced that benefits from wildlife were possible through sustained-yield management and that NPWS could promote such benefits as an extension service to the local community. A resolution by the committee members was that local headmen should form a security committee to prevent poachers from entering their area. In March 1987, Chief Malama convened a meeting of all headmen, instructing his village not to cooperate with poachers and to report to him the presence of any poachers who entered his area. Also in 1987, Chief Msoro, whose village is located east of Chief Malama's area, expressed a desire to have village scouts in his chiefdom, and later that year he personally arrested a resident within his village for poaching an elephant in the eastern half of Lupande outside the area of this project. In addition, the presence of poachers became known through the assistance of residents who volunteered the information. From January to August 1987, the arrest of three groups of poachers resulted from such information. Such assistance from local residents was a rare occurrence in previous years.

This positive change in local attitudes toward wildlife resources and the improved perceptions of NPWS was confirmed by the November 1987 questionnaire survey. Recognition of NPWS's Unit Leader as an appropriate channel to resolve conflicts over wildlife issues was suggested by the fact that 66 percent of the respondents said they seek the unit leader (or a senior NPWS officer) for such help. In addition, 63 percent approved of the village scout program. The most common reason for this approval was the reduction of poaching it has brought to their area. When asked whether the sustained-yield culling program should be continued, 86 percent re-

plied yes and 68 percent correctly perceived the role of this program as a way of bringing employment and development to their area. When asked where residents now go to find employment in their area, 64 percent answered they seek work through some form of wildlife management activity now being promoted by NPWS in Lupande.

Discussion

The Luangwa Valley, like many other wildlife areas in Africa, has a history of wildlife protection policies that are implemented to a large extent by civil servants who are not residents of the areas where they work. These policies have been both expensive and difficult to finance on a regular basis. Recent trends of elephant and black rhino poaching in the Luangwa Valley (Lewis 1986; Leder-Williams 1985) suggest that this form of law enforcement is limited in its effectiveness, is extremely expensive, and may be inappropriate for an area where the ratio of potential poachers to the number of arresting civil servant officers present is high or rapidly increasing.

Lupande Game Management Area supports both village residents and wildlife populations, whereas national parks allow no residency by villagers. Integrating local residents as part of the management solution to protect wildlife resources is an option available to game management areas. Furthermore, areas surrounding national parks are conduits for illegal hunters entering parks. If the value of conservation is fully appreciated by local communities in game management areas, the residents themselves might discourage illegal hunters from entering parks as well as their own areas. In theory, effective wildlife management outside protected areas should lower the costs of wildlife protection within these protected areas.

Involving local residents through wildlife employment and sharing wildlife revenues with tribal authorities are not new ideas (Western 1982; Rowan Martin, personal communication; Vedder 1989). A cost-benefit analysis for how such a program can be designed and budgeted is far less common, especially for the case where subsistence farming is practiced and wildlife is often considered a liability to farmers. The principle aim of this paper was to conduct such an analysis to evaluate the affordability and cost-effectiveness of this experimental design of wildlife management.

Improved Wildlife Management

Deployment of village scouts yielded a net increase of per capita man-day effort in law enforcement operations. In addition to a superior knowledge of the surrounding countryside, village scouts appeared to have an advantage over nonresident civil servant scouts in carrying out operations. This was apparent from the dra-

matic increase in arrests and firearm confiscations after the village scouts entered the work force. In addition to improved law enforcement, village scouts provided the badly needed services of monitoring safari hunting, conducting animal counts, and improving public relations between NPWS and the local community. Salary incentives for these scouts, though less than those of civil servant scouts, were above expected income levels for the area (Atkins 1984), and this undoubtedly contributed to their relatively high motivation for work. The overall cost of this program was Z K 63,685, which provided a manpower coverage of 8 km² per scout for the program area or approximately Z K 80 (or US \$10)/km².

Based on the decline of poached elephant carcasses found during the period of this study and the existing density of this species (Lewis 1986; Kaweche et al. 1987), potential revenues from future sustained-yield uses of elephants would more than meet the total costs of this program as based on current earnings in Zimbabwe (Rowan Martin, personal communication). In addition, approximately half of the costs for supporting the village scouts was equivalent to the total sums derived from revenue earned by ivory collection during scout patrols and by court fines from poachers arrested. Though these sources of revenue did not go back into the resource management costs of Lower Lupande, they do illustrate the amount of money the Zambian government could recover through this form of local involvement in wildlife management.

Public Attitudes and Perceptions

Public reaction in the local village community to the village scouts was initially negative but became supportive once the revenue benefits from wildlife to the local community became apparent. Providing local leaders with the information that more than 90 percent of the poachers apprehended by village scouts were people living outside their area appeared to encourage a more protective attitude for their wildlife. It also precipitated greater appreciation among residents for the role of village scouts.

Organizational and administrative leadership of this program was provided by the NPWS unit leaders. Their leadership was essential in promoting public awareness of how the involvement of local residents in management can contribute to improved economic benefits for residents from wildlife. Unit leaders also served as technical advisors to the local community on wildlife topics. During the local wildlife management committee meetings for each chiefdom, leaders were able to present the chief and committee members with information and ideas helpful to their area's wildlife development. Membership of this committee was primarily limited to the chief's council as a show of respect for traditional lead-

ership authorities in the villages. Such conformity with local customs may have increased the level of appreciation among residents of the increased employment and the shared wildlife revenues provided by this program. The perceptual changes expected would include greater understanding of the values of conservation and of the legitimacy of NPWS as a wildlife extension service. The results of the attitude survey suggested that such changes were evolving in the community.

Affordability of Conservation Based on the Lupande Model

Attempts to define the financial inputs necessary to sustain wildlife conservation costs in Africa are based largely on estimates from countries whose economies allow as much as US \$200/km² per year (IUCN/WWF/NYSS Elephant/Rhino Specialist Group Meeting 1986). Estimates range from three to five times higher for more developed non-African nations. In less developed countries whose economies are much weaker, conservation must be carefully budgeted since it generally receives a low priority of government spending. In Zambia, for instance, the average recurrent investment in conservation for its wildlife estate in the early 1980s was about US \$2 to \$4 per km².

This investment has been used to support a management approach whose design is basically modeled after much wealthier nations and requires inputs 50 times greater to be effective. Hence, there is great justification for examining alternative approaches to conservation in developing countries.

The experimental design described and tested in this study has revealed that wildlife conservation in areas outside protected areas can be made more cost-effective by combining the efforts of local residents with those of NPWS personnel, rather than engaging only NPWS civil servants. The overall recurrent costs for this program was Z K 175 (or US \$22) per km² and in less than three years, law enforcement efforts reduced illegal hunting of both elephants and black rhinos in the program area by approximately 90%. Such improvements in conservation also helped sustain future revenues from wildlife for local community benefits and helped meet wildlife management costs.

In 1987 total wildlife revenue exceeded the total annual operating budget for this management program by almost four times. More than half of the revenue entered Zambia's Central Treasury in the form of payments for hunting licenses. The revenue-sharing formula adopted in this design, however, provided Z K 146,400 for wildlife management costs, which exceeded recurrent cost by Z K 5,198. This marginally positive balance would have easily been a substantial positive one had the hippo utilization scheme not been canceled due to the anthrax outbreak. The anthrax outbreak that depleted the hippo population emphasized the need for a multiple-

use approach to wildlife resources to minimize dependence on a single source of income. As a result the Lupande Development Project subsequently embarked on a multispecies utilization scheme and a self-catering tourist enterprise owned and operated by the local community (Lewis, unpublished data). This has helped to diversify and maintain wildlife earnings at levels necessary to meet the overall needs of conservation and community benefits.

Results from this study suggested that maximizing revenue earnings for wildlife management costs may not be in the best interest of wildlife conservation. For instance, the revenue-sharing formula guaranteed significant shares of wildlife profits to the local community and the central government through its appropriate institutions. This revenue-sharing formula, combined with the high priority given to local employment, increased both public and political support for the economic importance of wildlife. This approach, which maximizes local benefits, contrasts favorably with the more traditional system using wildlife earnings to finance law enforcement activities to control illegal uses of wildlife.

The design also allowed market forces to dictate the actual earnings for conservation and community benefits since the hunting concession was based on public bids among the companies competing for this area. This approach ensured that the private sector was not overcharged for the concession and it also placed greater responsibility on local residents to help maintain this market value for their own community welfare.

Summary

1. An experimental program in Lupande Game Management Area, Zambia, tested the feasibility of allowing local residents to participate in managing wildlife resources through a joint partnership with the National Parks and Wildlife Service.
2. Such a partnership, in the form of village wildlife management committees, deployment of village scouts, a sustained-yield wildlife utilization scheme managed by local villagers, and wildlife-related employment for local residents, increased traditional authorities' involvement in planning for their wildlife resources. This approach was far more acceptable to the local community than past efforts to manage wildlife by relying entirely on government authorities.
3. The cost-effectiveness of wildlife law enforcement increased dramatically with the establishment of village scouts, who were all local residents trained under this program to manage and police the wildlife resources in their respective chiefdoms.
4. Revenue earned by charging a concession fee for a self-sustained and carefully regulated off-take of wildlife trophies by safari hunting sportsmen was sufficient to meet the recurrent costs of this program.

5. A multi-use approach to wildlife management was found to be desirable to minimize risks of cash shortfalls in maintaining the costs of this program on an annual basis.

6. A management linkage with tribal authorities as was used in this model study will reduce the costs of protecting wildlife resources in adjacent national parks where human cohabitation with wildlife is not allowed. Once monetary benefits from wildlife are made legally available to local residents living outside the national park, nonresident intruders who threaten this resource will be unwelcome and be discouraged from entering the area, even to gain access to the national park.

Acknowledgments

This paper resulted from the dedicated interest and commitment by the National Parks and Wildlife Service to solve wildlife conservation problems in areas surrounding the national parks of this country. Substantial support was provided by various international conservation agencies: the Wildlife Fund (USA), Wildlife Conservation International of the New York Zoological Society, the Mzuri Foundation, the Shikar Foundation, Africare, and the Wildlife Conservation Fund. Particular thanks is offered to Mr. William Lloyd, who has been a constant source of ideas, inspiration, and support from the very beginning of this study. This paper also benefited from our discussions with Lawrence Bannister, Jonah Western, Chuck Carr, Michael Wright, Rowan Martin, David Cumming, Jordan Holtam, Paxton Mwimanzi, Flywell Munyenjembe, and many of the local residents of Lupande Game Management Area.

Literature Cited

Atkins, S. L. 1984. Socio-economic aspects of the Lupande Game Management Area. Pages 49-55 in D. B. Dalal-Clayton

and D. M. Lewis, editors. *Proceedings of the Lupande Development Workshop*. Republic of Zambia.

Bond, G. C. 1976. The politics of change in a Zambian community. University of Chicago Press, Chicago, Illinois.

Dalal-Clayton, D. B., Magai, R. N., and Veldkamp, W. J. 1984. Preliminary land classification and land evaluation in Lupande Game Management Area. Pages 29-48 in D. B. Dalal-Clayton and D. M. Lewis, editors. *Proceedings of the Lupande Development Workshop*. Republic of Zambia.

Leder-Williams, N. 1985. Black rhino in South Luangwa National Park. *Oryx* 19:27-34.

Lewis, D. M. 1986. A management study of the Luangwa Valley elephants. National Parks and Wildlife Service publication. Lusaka, Zambia.

Lewis, D. M., and Kaweche, G. B. 1984. The Luangwa Valley of Zambia: preserving its future by integrated management. *Ambio* 14:362-365.

Malama, G. 1984. Welcoming address by the Honorable Chief Malama. Page 8 in D. B. Dalal-Clayton and D. M. Lewis, editors. *Proceedings of the Lupande Development Workshop*. Republic of Zambia.

Marks, S. A. 1976. Large mammals and a brave people. University of Washington Press, Seattle.

Prins, G. 1980. The hidden hippopotamus. Cambridge University Press, Cambridge, England.

Roberts, A. R. 1973. A history of the Bemba. University of Wisconsin Press, Madison, Wisconsin.

Vedder, A. 1989. In the hall of the mountain gorilla. *Animal Kingdom* 92:31-43.

Western, D. 1982. Amboseli National Park: enlisting landowners to conserve migratory wildlife. *Ambio* 5:302-308.

Willis, A. J. 1985. An introduction to the History of Central Africa. 4th ed. Oxford University Press, Oxford, England.

