



QUOTA

SETTING

MANUAL

WILDLIFE MANAGEMENT SERIES

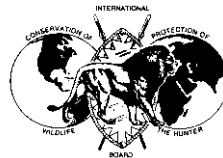


Q U O T A

S E T T I N G

M A N U A L

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Safari Club International

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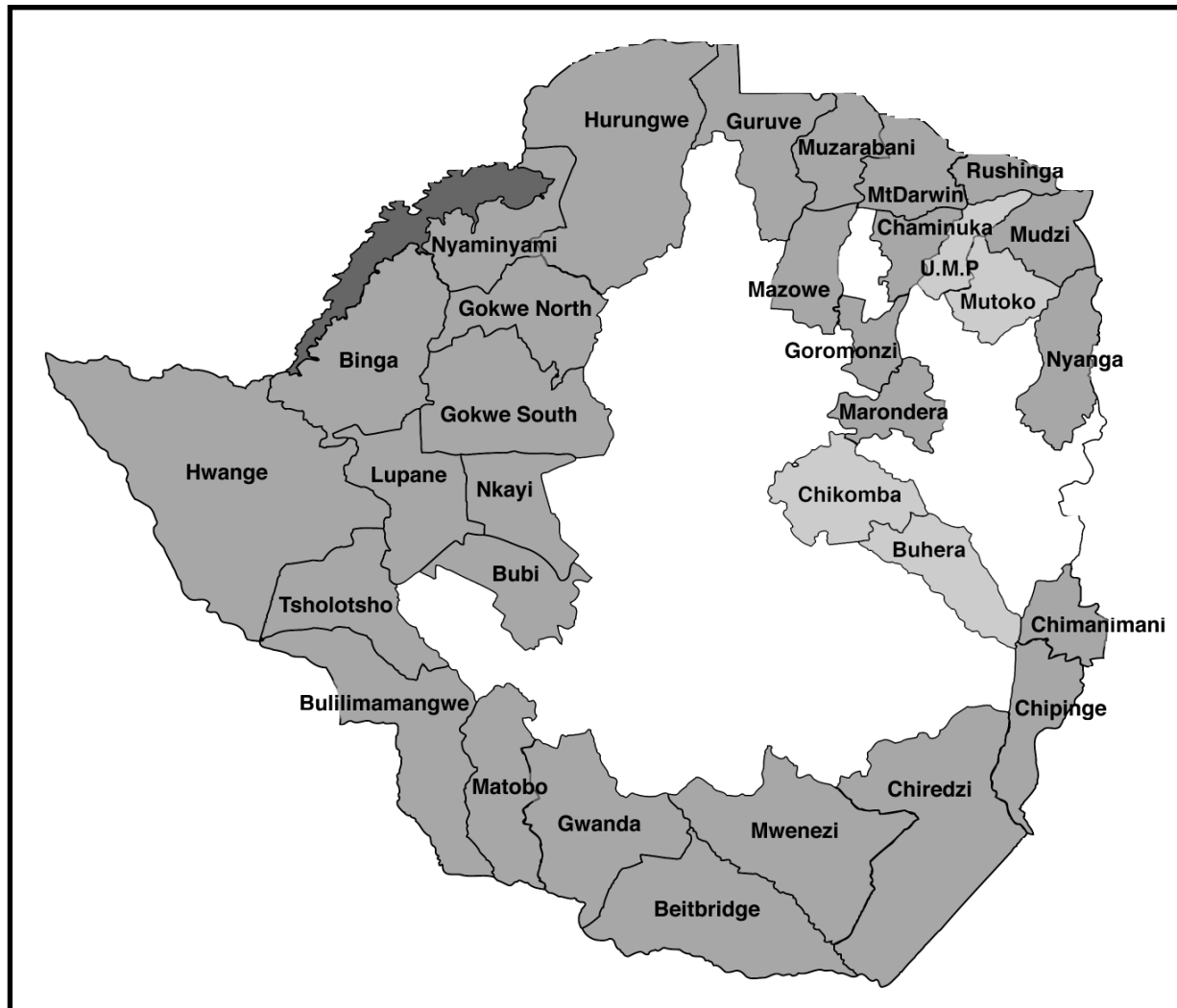


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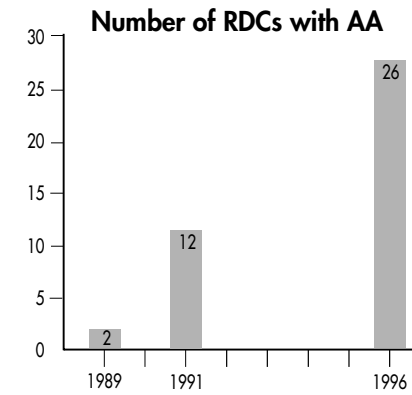
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Rural District Councils with Appropriate Authority



Growth in Appropriate Authority (AA) status for Rural District Councils (RDC's).

Since 1989 the number of RDC's with AA has grown dramatically. Today they cover nearly half of Zimbabwe.



CAMPFIRE (the Communal Areas Management Programme for Indigenous Resources) is the programme in which rural communities participate and benefit from the management of their wildlife and other natural resources.

In the past wild animals were managed and only killed with the permission of traditional leaders. During these times there was plenty of wild land and animals for everyone. People going into the bush would report back to the chief on what they had seen.

Using this information the chief would decide:

- who could hunt,
- where they could hunt ,
- which species they could hunt and
- how many animals they could kill, especially during harsh times

These decisions were made as part of a complex system of management where sanctions and access to natural resources were determined according to traditions operating within the culture.

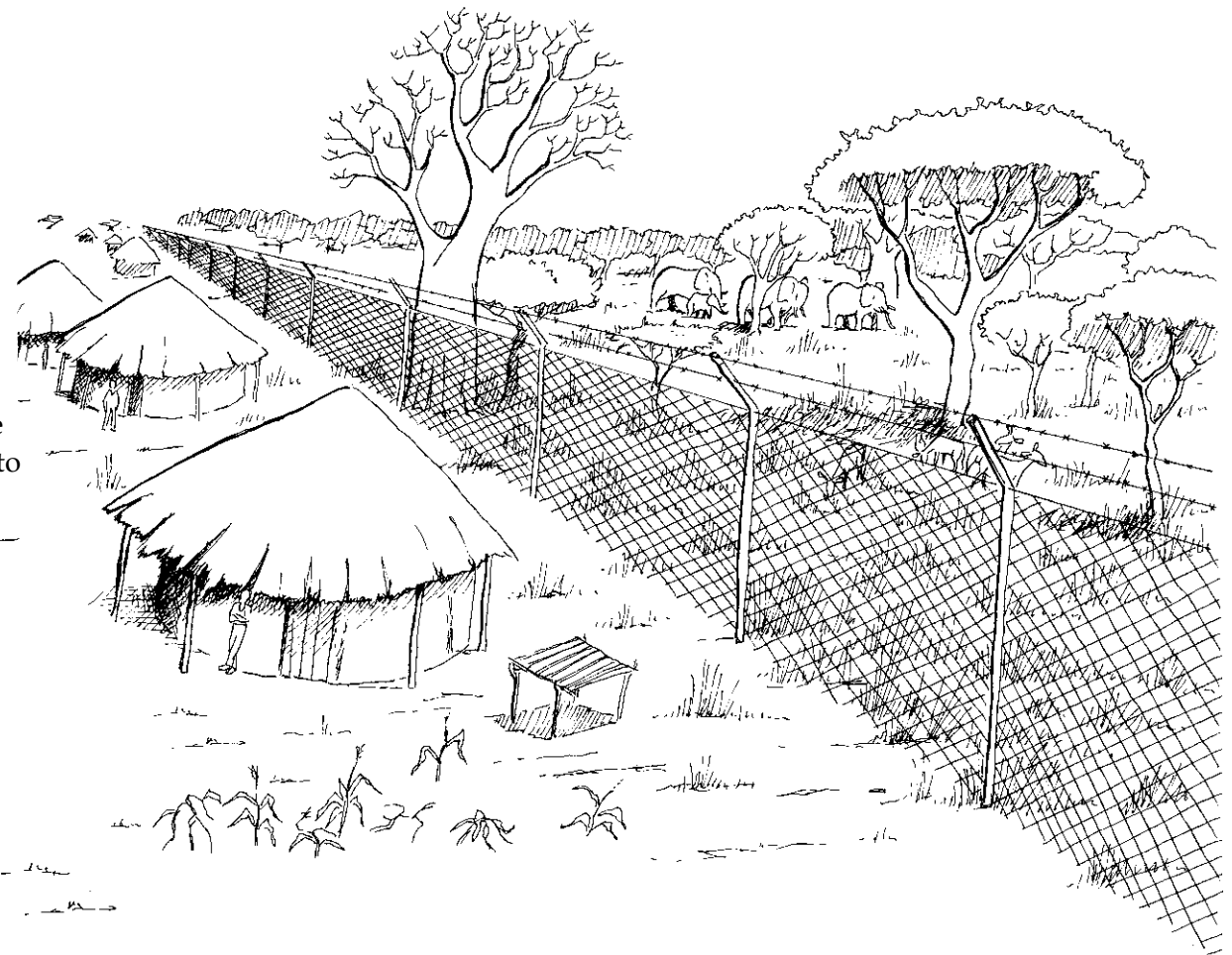
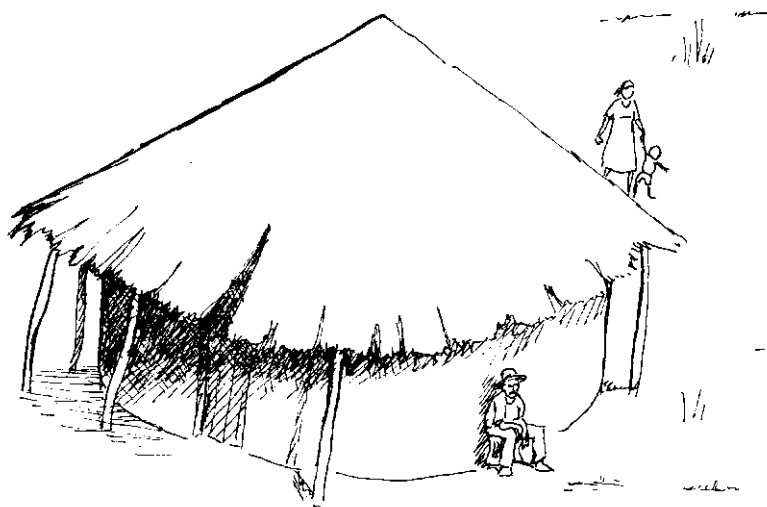
Wildlife management in the past



During colonial times new national game laws and regulations were enacted. These were not made for rural communities and were often used against them. While after 1975, commercial farmers were allowed to manage and benefit from wildlife on their farms, it was only following independence in 1980 that change in the management of wildlife came to communal areas through the CAMPFIRE programme.

CAMPFIRE aims to re-establish the links which used to exist between rural people and their natural resources. By giving rural communities the option to manage their wildlife, government wishes that these communities can benefit as well as share in the responsibility for managing the resource as provided for in the legislation. These changes now provide an opportunity for wildlife to become an important resource to rural district councils, wards, villages and households.

Wildlife management during the colonial period



Along with this opportunity come important new wildlife management roles for district councils which were previously carried out by the Department of National Parks and Wildlife Management (DNPWLM). One of these roles is to recommend to DNPWLM the **setting of quotas** for the number of animals which can be killed in each district every year.

This manual is designed to inform people involved in wildlife management within rural districts about the importance of quota setting and provide some biological background to quotas.

Wildlife management with CAMPFIRE

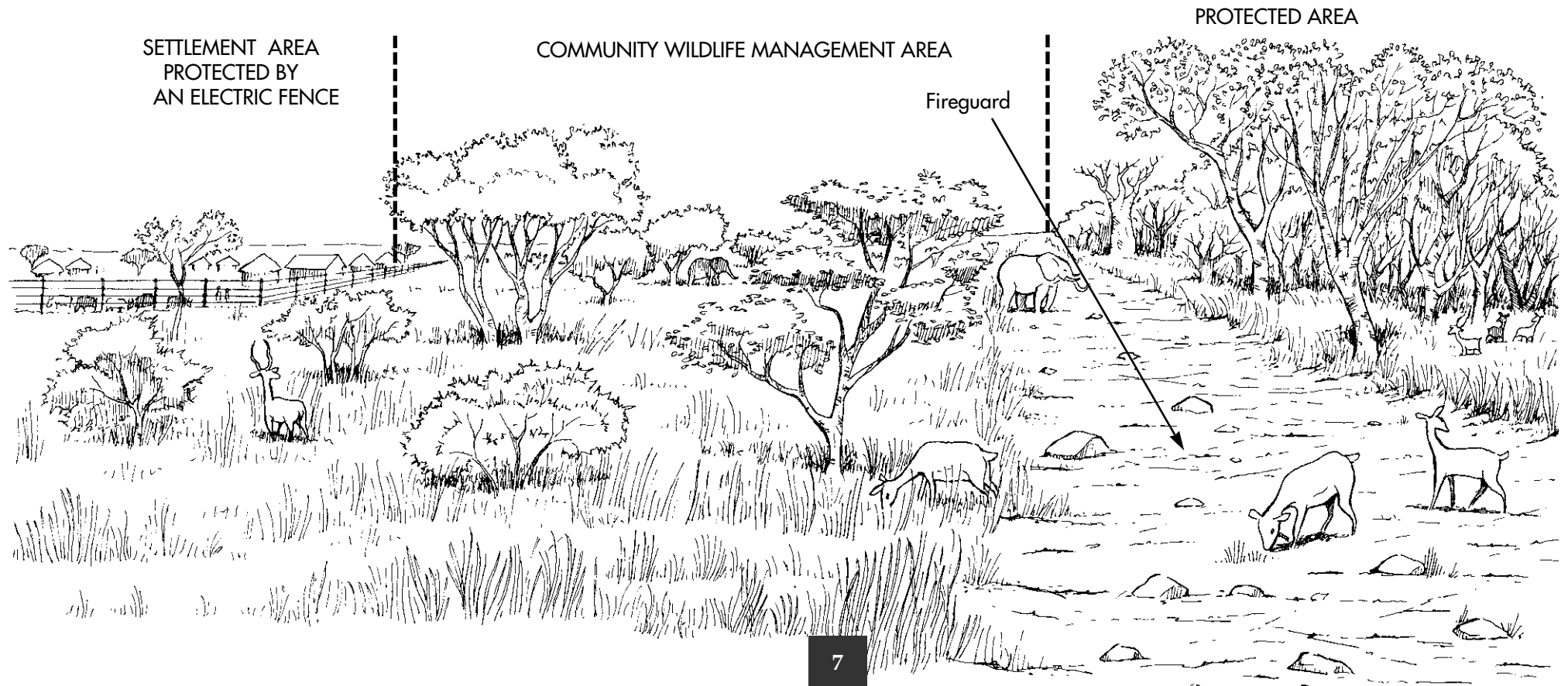


Table 1: Different uses of the quota

USE	REASON	BENEFIT
Sport hunting	to provide a number of animals which may be killed by sport hunters so that there is no decrease in the number of trophy animals over time	money
PAC (Problem Animal Control)	to allow a certain number of problem animals to be killed	reduce human/wildlife conflict
Cropping	to provide a regular and continuous supply of meat to people living with wildlife	protein/food
Translocation/Live sales	to establish wildlife elsewhere	expand conservation and utilisation benefits
Culling	to reduce the number of a certain species to reduce population pressure	money, food, conservation
Local hunting	to enable local people to hunt wildlife in their home areas	recreation, employment, meat

An example of a quota

Hunting Area: Makomichi Communal Lands (Pamberi District)

Area (sq. km): 810

Year: 1996

Operator: Mzezewa Safaris (pvt) Ltd.

SPECIES	QUOTA
ELEPHANT (M)	3
ELEPHANT (F)	1
BUFFALO (M)	6
BUFFALO (F)	4
LION	2
LIONESS	0
LEOPARD	3
HYEANA	2
ELAND (M)	8
SABLE	3
KUDU	5
KUDU COW	5
BUSHBUCK	3
WILDEBEEST	0
ZEBRA	1
IMPALA (M)	45
IMPALA (F)	45
DUIKER	10
JACKAL	4
BABOON	25
FRANCOLIN	150
GUINEA FOWL	100
DUCKS/GEESE	30
PIGEONS/DOVES	200
SANDGROUSE	200

Notes: These may include any rules and regulations that should be observed when utilizing the quota. Details of the concession fee may also be included here.

What is a quota ?

In wildlife management, a quota represents the number of animals that can be safely removed/harvested from a population each year without biologically damaging that population.

Why do we need to set quotas ?

Setting quotas ensures that wildlife populations maintain themselves and continue to survive biologically into the future. Only through continued survival of these populations can financial and economic benefits be ensured. To do this we need to have an idea of how many animals there are and how many of these animals can be used. A combination of local knowledge and scientific methods will greatly help the process of establishing animal numbers and setting quotas.

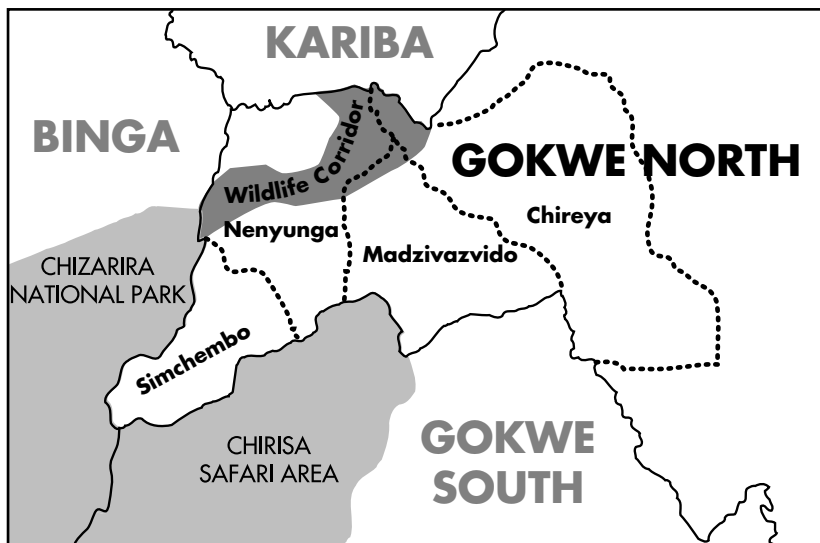
How can communities use their quota?

Table 1 on page 8 shows six different ways in which a community may decide to use its quota. Since each use has different advantages and disadvantages, communities must decide which uses are most important to them. These uses are called the 'management objectives' of a quota. They should support the overall objective of CAMPFIRE which is for rural communities to continue to enjoy the benefits of wildlife now and in the future.

What area is covered by a quota?

Quotas can cover almost any area that supports wildlife. The size of the area covered by a quota may vary according to the purpose of the quota. For example, the area covered by a sport hunting quota should be sufficiently large to contain enough animals each year to support a commercial safari operation. For a traditional hunting quota the area could be smaller as fewer and different animals may be hunted. A cropping quota might cover a large or small area.

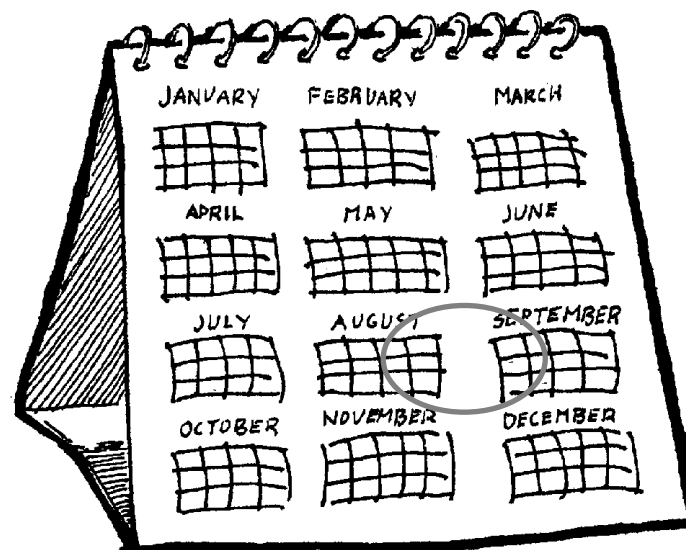
Area (wildlife corridor) covered by a sport hunting quota in Gokwe North District

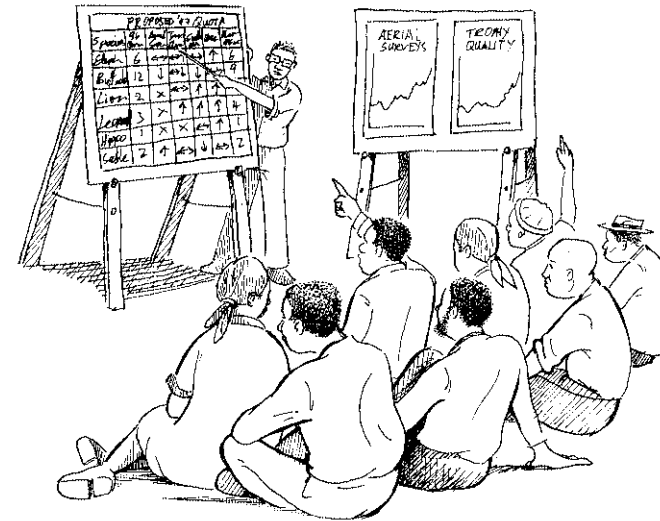


How often are quotas set?

Quotas are usually reviewed annually. This interval, which coincides with the annual breeding cycle of most wildlife species, allows new information on the increases and decreases in animal numbers to be used in the future. The quota may be changed at the end of each year if necessary depending on this new information.

Calendar showing when the district quota should be set





When should quotas be set?

Quotas follow the calendar year. Ideally, the proposed quotas and information about them should be submitted to DNPWLM before the end of September of each year. This is important as:

- most safari operators attend “hunting fairs” in the USA or Europe in January and February each year. Here they meet their buyers and sell their hunts. To do this they need to know what species and how many animals are in the quota for their areas.
- district officers will need to know the quota in order to finalise hunting contracts with safari operators and arrange for the initial payments on leases.
- it will give communities some idea of the income they will expect to generate in the coming year for their projects.
- it will allow DNPWLM sufficient time to approve or adjust the quota and to complete the necessary administration procedures.

How are quotas currently set?

Previously the DNPWLM has set all the quotas in the communal lands with little consultation by using aerial survey results and other sources of information. Today, the DNPWLM sets these quotas only after discussions with RDCs. In the future the aim is to give more authority and responsibility to communities. Although the DNPWLM will

still retain the final authority over setting the quotas in the communal lands, it seeks to encourage districts to set up a process which allows much greater participation in quota setting by people living with and using the wildlife.

Why should local people be involved in quota setting?

Government realises that if people who live with the wildlife do not feel ownership towards it and a desire to care for or husband it, this resource will not last. Participation in information gathering and decision making are important ways for rural people to assume the ‘co-management’ responsibilities for wildlife management involved in CAMPFIRE.

What organisations can help RDC’s in quota setting?

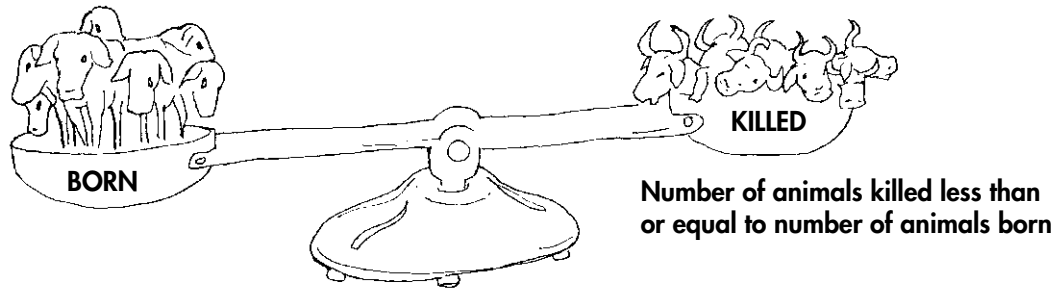
Government realises that it is impossible for local people to suddenly start setting reliable quotas for their areas without the necessary information and training. So to help RDC’s and rural people carry out this new responsibility, there are a number of organisations willing to help. These organisations are listed in table 2 on page 12 together with the kind of help they can offer.

Table 2: The organisations and their role in helping with quota setting.

Organisation	Type of help which can be offered
DNPWLM	Statutory authority for wildlife management in Zimbabwe Approves final quotas for communal lands.
CAMPFIRE Association	Political representation for quota issues.
WWF	Aerial survey results for all communal lands
ZimTrust/WWF/SCI	Facilitate training workshops and technical assistance with quota setting
Safari companies (Safari operator)	Knowledge of the wild animals in the hunting or photographic lease area.

The addresses of the first four organisations are listed at the back of this guidebook for councils wishing to contact them for assistance.

WHAT INFLUENCES THE QUOTA?

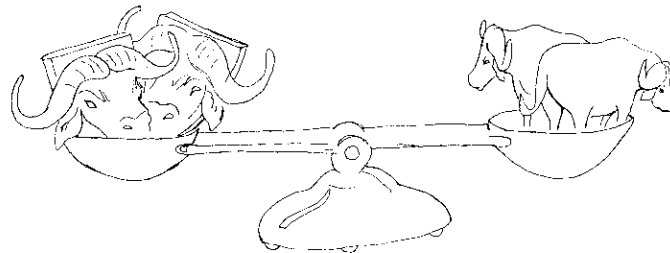


How do CAMPFIRE objectives affect the quota?

Since the overall objective of CAMPFIRE is for rural communities to continue to enjoy the benefits of wildlife year after year, we should set a quota which allows a population of wild animals to be sustained. This means that:

- the number of animals killed is replaced each year by the number of animals born or;
- the number of animals killed for their trophy equals the number of young animals maturing into the trophy class.

Number of trophy animals killed equal number of animals maturing into trophy animals



How is a quota worked out?

The main purpose of a quota is to identify the number of animals that can be killed without reducing the population. This depends on:

- the number of animals living in the area, called the 'population'
- the rate at which these animals can be harvested, called the **percentage 'offtake rate'**

The number of animals multiplied by the offtake rate gives the quota:

$$\text{Population number} \times \text{Offtake rate} = \text{Quota}$$

How do we decide the offtake rate?

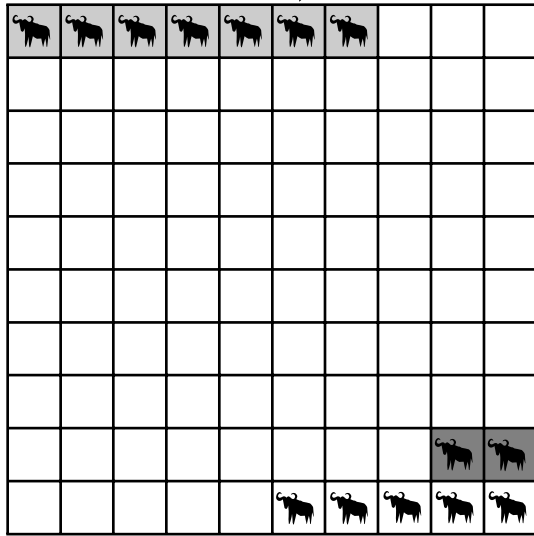
We decide what the offtake rate will be by first working out the **growth rate** of the population. The growth rate is the difference between the number of natural births and natural deaths for every 1000 animals in the population. If, for example, there are 200 births and 100 deaths in a population of 1000 hippos the growth rate will be:

$$\begin{aligned} \frac{(200 - 100)}{1000} &= \frac{100}{1000} \\ &= \frac{10}{100} \times 100\% \quad \text{or } 10\% \end{aligned}$$

Normally the offtake rate is fixed either equal to or slightly lower than the growth rate. In this way, while the growth in population size may be slowed down, the total number of animals in the population does not fall. The quota can therefore be considered sustainable.

IN (Total 7%)

Natural population increase



BUFFALO OFFTAKE RATES

In the box, each square represents 1% of the buffalo population. In order to sustain the existing population and maintain the resource, the number of buffalo used for sport hunting, cropping, or live sales should not exceed the natural population increase.

OUT (Total 7%)

This total may be a mix of sport hunting, cropping and live sales.

Sport hunting

Cropping and live sales

Key



% Increase in an average year (births exceeding deaths)



% Females



% Adult males

Lets say that a buffalo population grows, on average, at 7% each year. This means that the offtake rate can be less than or equal to 7%. Thus if there are 100 buffalo living in the area, up to 7 buffalo can be harvested.

If these buffalo are being cropped for meat, the maximum offtake will be seven, since the natural excess of births over deaths in this population each year is 7.

But if we wish to allocate the offtake to trophy hunting only, we will have to set the **trophy hunting offtake rate** at 2%, because only two adult males mature each year into the particular age class that trophy hunters want to shoot. This is explained further in the next section 'what factors affect offtake rates'.

Since our overall quota must not go above 7, if the 2 trophies are shot, then only 5 buffalo will remain for cropping. If any of these are young bulls however, it will affect future trophy hunting since we will be shooting a bull which would have matured to become a trophy bull. So the best option is to harvest 5 old females rather than trophy bulls or prime breeding cows.

The relationship between the offtake rate and the use to which the quota is put is summarised in the table below.

Table 3: Relationship between offtake and use

Use	Management objective	Offtake rate
Sport hunting	maintain trophy quality	much lower than natural growth rate
Cropping	sustained yield of wildlife products	slightly less than natural growth rate
Problem animal control	reduce human/wildlife conflict	only get rid of problem animals

What factors affect offtake rates?

1. The class of animal we wish to harvest.

When we decide to use our quota we can:

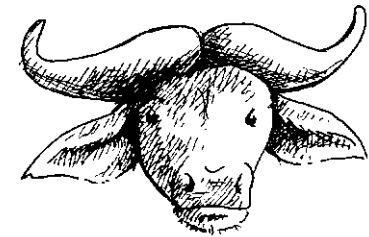
- **be non-selective and harvest any animal.** With this option it doesn't matter if the animals are young or old, male or female.
- **select and harvest a particular age or sex group** of the population. For example, adult males are most commonly killed in trophy hunting. This is highly selective and requires lower offtake rates because only certain age classes of animal within the population are being harvested. Let us again use buffalo as an example.

Suppose that we have a population of 100 buffalo in our district and the safari operator tells us that he has clients who will pay a lot of money to shoot trophy buffalo. The clients are not willing to pay to shoot a young buffalo because for example a six year old bull will have shorter horns and a soft boss; his horns will probably measure only 30 - 35" which will not satisfy a client. If that animal is left to mature, his horns will lengthen and his boss harden. By the time he is 8 - 12 years old he will have become a good trophy with horns of around 40 - 45 inches.

In a herd of 100 buffalo at any one time there are probably about 10 bulls that are potential trophies. This is because there are about two bulls who are mature in each of the age groups



SUITABLE
Mature bull,
large horns, hard boss
more money



NOT SUITABLE
young bull
small horns, soft boss
less money

8 - 12. Each year about two young bulls mature into this trophy class, which means that each year two mature bulls can be shot without lowering the total number of trophy bulls in the population. These figures, including the offtake rate of 2% have been determined from practical experience. Offtake rates approved by the DNPWLM for most animals in Zimbabwe are included as an appendix to this booklet. The following examples on pages 16 and 17 show the difference between a sustainable offtake and an unsustainable offtake.

Table 4: A Sustainable Offtake

Examples of Sustainable Offtake of Trophy Buffalo from a Population of 100 Animals										
	Year 1		Year 2		Year 3		Year 4		Year 5	
Age Classes	Number of Trophy Animals	Number of Trophies Shot	Number of Trophy Animals	Number of Trophies Shot	Number of Trophy Animals	Number of Trophies Shot	Number of Trophy Animals	Number of Trophies Shot	Number of Trophy Animals	Number of Trophies Shot
8	2		2		2		2		2	
9	2		2		2		2		2	
10	2		2		2		2		2	
11	2		2		2		2		2	
12	2	2	2	2	2	2	2	2	2	2
Total	10	2	10	2	10	2	10	2	10	2

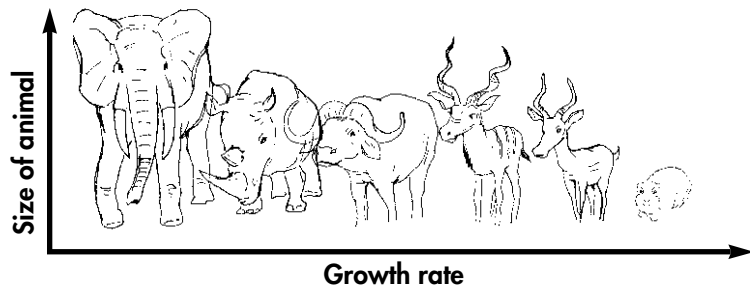
Each year two buffalo move up into the next class. In this example two trophy buffalo are shot each year. The total number of animals within the trophy class each year stays the same at 10. So each year a community would receive a regular payment for managing its buffalo sustainably.

Table 5: An Unsustainable Offtake

Example of Unsustainable Offtake of Trophy Buffalo from a Population of 100 Animals										
	Year 1		Year 2		Year 3		Year 4		Year 5	
Age Classes	Number of Trophy Animals	Number of Trophies Shot	Number of Trophy Animals	Number of Trophies Shot	Number of Trophy Animals	Number of Trophies Shot	Number of Trophy Animals	Number of Trophies Shot	Number of Trophy Animals	Number of Trophies Shot
8	2		2		2		2	2	2	2 + 2 N/T*
9	2		2		2	2	2	2		
10	2		2	2	2	2				
11	2	2	2	2						
12	2	2								
Total	10	4	8	4	6	4	2	4	0	0

*N/T = Non trophy

Again in this example two male buffalo move up into the next class each year, but in each year four trophy bulls are shot. As the numbers show, the hunter can only continue to shoot trophy bulls for five years since at the end of this time there are none left. While in the short term the community will get more money, this income is not sustainable and will lead to a loss of income after five years.



In general the smaller the animal the faster it breeds and the higher the offtake rate.

2. The type or species of animal being harvested.

Every species of animal is slightly different in its size, the number of young born to each female and its behaviour. All of these, as well as client preference, affect the offtake rate.

- **size**

Just as we know that cattle breed more slowly than goats, so larger wild animals breed more slowly than smaller wild animals. This means that offtake rates for larger animals tend to be lower.

Larger animals also take longer to become trophy animals. The larger antelope (sable, eland, kudu) and buffalo mature into trophies at about eight years and their offtake rates are about 2%. The smaller antelope (impala, duiker, etc.) have full sized horns much younger (about three to five years) and their offtake rates are higher at 3-5%.

Elephant are large slow growing animals. They have a life cycle similar to humans and mature much later than antelope or buffalo. A 60 pound trophy bull is probably around fifty years or older. That is why the offtake rate for elephant bulls is set at less than 1%.

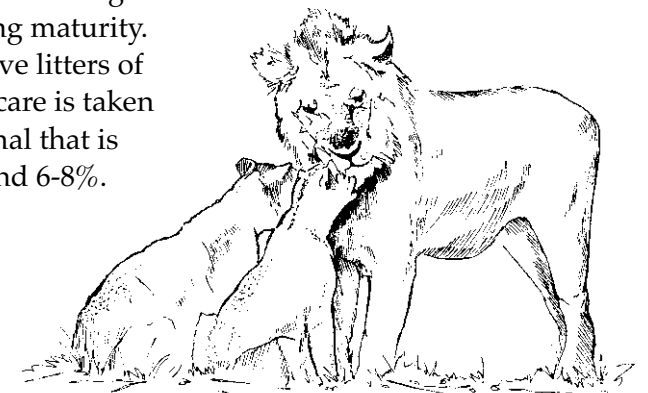


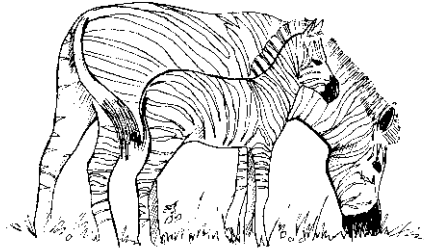
- **number of young born**

Animals that have more than one young breed faster so that offtake rates can be higher. For example warthog have three to six young each year, so they can be harvested at 5% for trophies and 20% for meat.

- **behaviour**

With some animals we need to be aware of the effect that shooting adult males will have on the growth rate of the population. Male lions live in groups and each group will try to keep a pride of females, fighting off groups that have no females. If some of those in the group are shot, this weakens the group and they will be unable to defend their pride. This will result in them being replaced by a second group of male lions. The first thing this **'winning'** second group does is to kill all the cubs of the first group because this has the effect of making the lionesses ready to breed with them. So shooting adult male lions can seriously disrupt breeding behaviour and result in fewer lions reaching maturity. Nevertheless since most cats have litters of several young, as long as great care is taken over the age and sex of the animal that is killed, offtake rates can be around 6-8%.





Zebra are mostly used
for their skin

- **client preference**

With some species the hunting client is not looking for the size of the horns but for the skin. Zebra is an obvious example. Since the client does not need a mature adult male and is happy with the skin of any fully grown male or female, the offtake rate can be set higher at around 5% compared to animals where horns or tusks are important.

3. The number of animals we want in the particular area.

So far we have discussed a situation in which we want to keep things as they are. In our example we harvested no more than seven buffalo each year in order to maintain a stable herd of 100 buffalo. However a wildlife manager should also ask the question - 'do we want more or less animals?' **and relate the numbers of animals in the area to the management objectives which have been decided.**

For example, where there are too many elephant and they are damaging the vegetation, it may be necessary to increase the number of elephant 'culled'. On the other hand, if a species has been over-hunted in the past and trophy quality has declined it may be necessary to reduce the offtake for a few years until trophy quality is restored.

In the first case, a stable situation is maintained by the quota being equal to the population growth rate.

Table 6: Quota and population growth rate

Objective	Actions
Maintain a stable population	quota = population growth rate
Reduce population	quota more than population growth rate
Increase trophy quality	quota much less than the growth rate

In the second case, where we want to reduce the elephant population, by including a culling quota, the total quota can exceed the population growth rate.

In the third case, the quota must be much less than the growth rate if trophy quality is to be restored.

As a general rule, though, in order to sustain the resource, the quota must be set less than or equal to the population growth rate. (see Table 6 above)

How do we know if a population is increasing or decreasing?

Although our counts of animals are often very crude, we are fortunate in being able to measure trophy quality accurately. Monitoring trophy quality is one important and very useful way of ensuring that the offtake is sustainable. It provides an accurate and sensitive method of checking that animals are not being over used by safari hunting. (These issues are dealt with in greater detail in chapter four).

In general however, wildlife management should be seen as a process of trial and error whereby we put in place an offtake rate which may need to be adjusted if our management objectives are not being met.

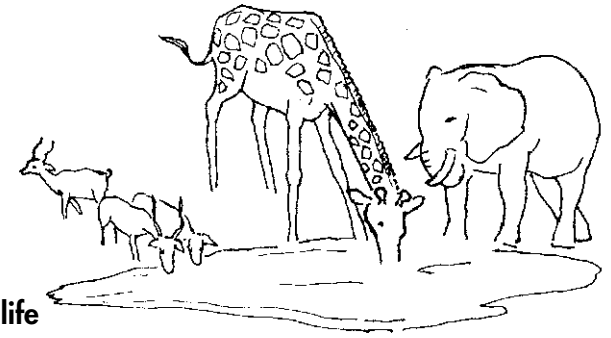
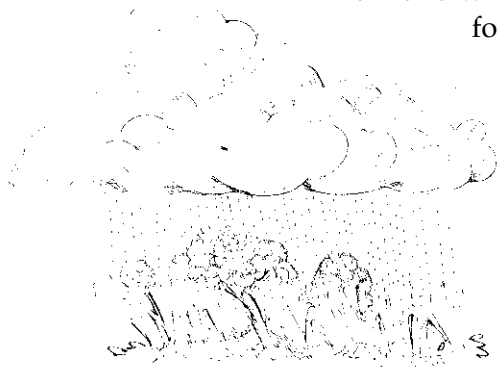
So for example, if our objective is to maintain the quality of elephant trophies in order to maximise the revenue from sport hunting and we find that trophy quality is declining, then we should reduce the quota.

4. What other factors affect the number of animals in a population being harvested?

Our quota is linked to the growth rate of a population. There are many natural factors which can speed up or slow down the growth rate in a year or over a number of years.

- **Rainfall**

Probably the most important is rainfall. The amount of rain and where it falls affects how much food is produced each season for the animals to eat.

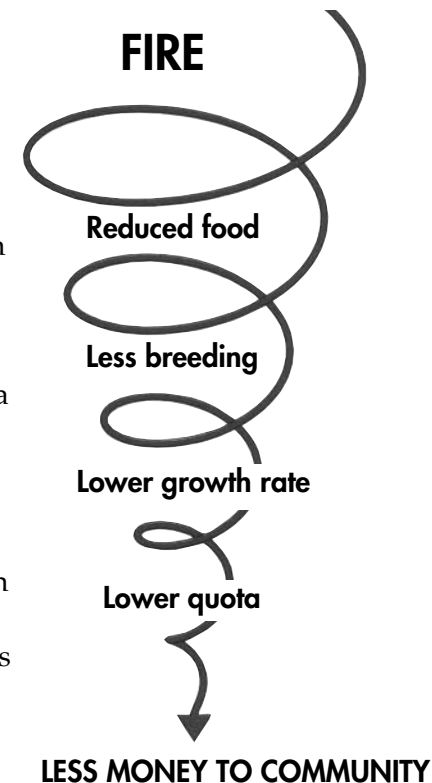


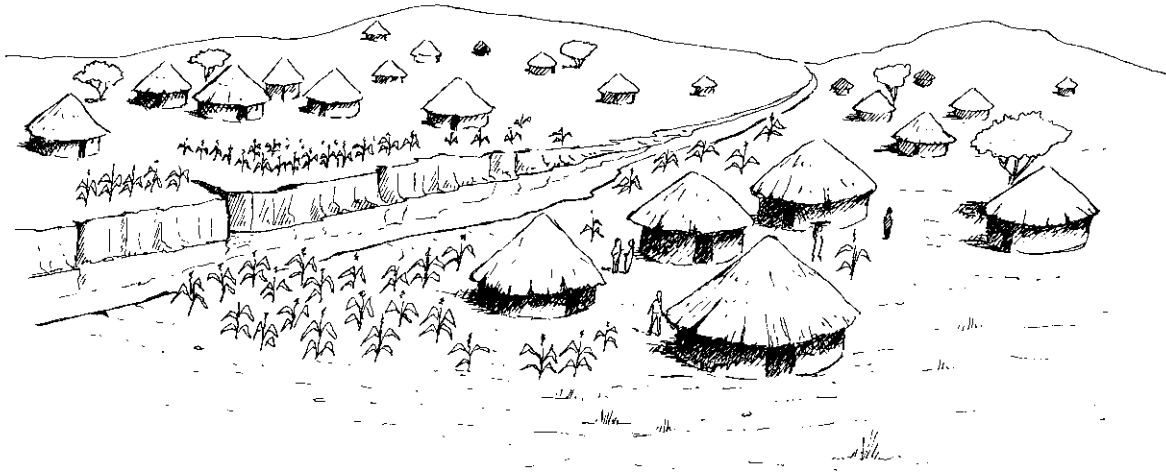
- **Surface water supplies for wildlife**

The distribution of surface water in rivers and pans and how long these water supplies last into the dry season are also influenced by rainfall. If a severe drought is experienced, animals can be expected either to die or not to breed so successfully as in a normal year.

- **Fires**

Fires, especially hot dry season fires, reduce the amount of food available to wildlife. This will affect the breeding and survival of wildlife populations which, in turn, reduces the number of animals which can be hunted. Thus fires can influence the amount of income earned by a community from wildlife. If these fires take place every year, which is the case in many districts, wildlife management programmes can be severely disrupted. However, because the effect is indirect, it is not readily appreciated.





- **Uncontrolled settlement**

Uncontrolled settlement and illegal migrants leads to the loss of important habitats for wildlife and a reduction in the amount of land available for animals. Where settlement takes place continuously along rivers which are important sources of water for wildlife, access to this water is prevented and this also affects wildlife populations. Consequently, an overall reduction in animal numbers leads to a decrease in the number of animals that can be hunted and thus the income earned.

It becomes very important therefore that districts and communities develop a **land use plan** so that conflicts with animals are reduced.

- **Cross boundary populations**

Since wild animals move around freely, many of them move in and out of communal areas that are adjacent to Parks and Wildlife land. Quotas must take account of this movement of animals between protected areas and communal land.

Let's suppose that a ward has a herd of animals that spends approximately half its time in the ward and half in the Parks estate. In this case the number of animals making up the population or herd, should be divided in half when calculating the quota.

If animals from adjacent protected areas are also responsible for causing problems such as crop raiding it may be necessary to seek supplementary offtake quotas to help deal with the problem. But a clear understanding of the nature of the problem is necessary. For more information on this important topic, please refer to the WWF booklet on '**Problem Animal Reporting**'.

Why is it important to monitor populations and offtake rates?

Unless we continuously assess the animals being harvested, and the rate of offtake, there is the danger of over-hunting. The argument works the other way as well. It may be possible to increase the offtake rate but if there is no on-going assessment or monitoring in place, the opportunity to increase the quota could be missed.

Monitoring populations and the factors which influence them, together with measurements of hunting success are discussed in the next chapter.

District Wildlife Assessment Form

Name of district.....Pamberi

Area covered (district/ward/village).....Mushavi Ward

Method used.....Informal community survey

Date assessed.....March 1995

Name of Enumerator.....R.Phiri

ANIMAL	ESTIMATE OF NUMBERS	RESIDENT/ NON-RESIDENT	LOCATION IN DISTRICT
Elephant	50	R/NR	to and from Matete pan
Buffalo	200	R	by Senka Lake
Sable	50	R	in scrub and wood
Impala	300	R	throughout
Eland	50	NR	occasionally move into area bordering Parks

R = Resident

NR = Non - Resident

Why do we need to monitor wildlife populations?

Continuous monitoring of wildlife numbers is essential in order to detect trends so that we can re-adjust our earlier management decisions. Having information about wildlife numbers, enables districts to maximise their production and revenue without destroying the wildlife resource.

As well as wildlife numbers, we also need to monitor other events such as rainfall and fire to help us understand why changes in the wildlife population are taking place.

How do we know how many animals there are?

In order to work out a quota we need to know how many animals there are in a particular area. To do this we must carry out a survey to estimate the population size of each species. This provides us with a list or inventory of the estimated numbers of animals in an area at a particular time.

An inventory of wildlife should include information about:

- where the animals are; for example if they are spread throughout an area or concentrated in specific places
- when they are counted, such as the month of the year or season
- by whom they are counted
- by which method they are counted

Wildlife monitoring forms (for an initial assessment) can be tailored to each district's needs, but may look similar to the example given opposite.

What methods are used to count wildlife in an area?


There are different ways of estimating wildlife populations. One set of methods relies on sample counting over a small area or strip in order to predict total population size, while another set of methods relies on indicators which we can use to tell us whether the population size is growing, staying about the same, or falling.

How is sample counting used?

Since it is not usually possible to count every animal in a large wildlife area, a smaller area or sample is usually taken in which all the animals are counted. From this we can predict numbers for the whole wildlife area, provided that animals are spread throughout the whole area evenly. This will give us an estimate of numbers. Most importantly, counts should be applied in a consistent and repeatable manner on each occasion.



Sampling is a common technique used to estimate the quality of crops. For example the Grain Marketing Board (GMB) can't examine all the produce it wishes to buy. Instead a sample of grain such as maize is taken from the seller's containers. The GMB assumes that what is examined in the sample is similar to the rest of the bag.

 10sq. km	10sq. km
10sq. km	10sq. km

Let us suppose that our wildlife area is 40 square kilometres and we sample 10 square kilometres in which there are 6 elephants. Since the sample area is one quarter the size of the whole area, the number of elephant in the whole area is estimated to be 24.

Total area = unshaded area + shaded area

$$40 \text{ sq. km} = 30 \text{ sq. km} + 10 \text{ sq. km}$$

In 10 sq. km found 6 elephant

therefore in 1 sq. km there are $\frac{6}{10}$ elephant

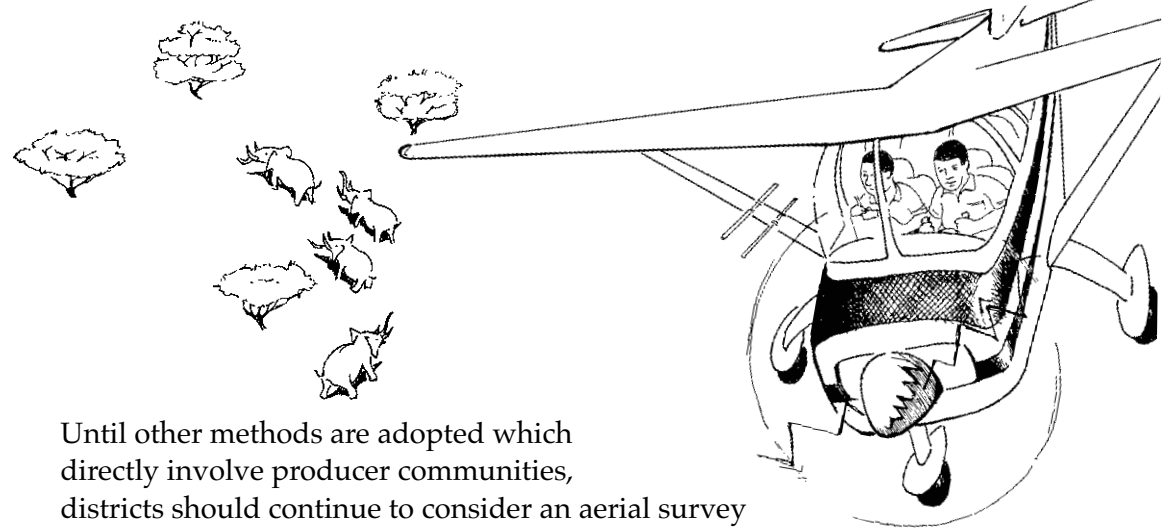
therefore in 40 sq. km there will be $\frac{6}{10} \times 40$ elephant

therefore the population estimate is 24 elephant

There are two ways of estimating total numbers from a sample:

- **Aerial sample surveys (surveys from aircraft)**

These are carried out by trained staff from the DNPWLM with assistance from WWF once a year. The surveys are done during the dry season when animals can be seen more easily because there are no leaves on the trees. While large areas are covered quickly by aircraft, aerial survey is expensive and only reliable for larger game species such as elephant, buffalo and sable. Because of its cost, an aerial survey is usually only conducted once a year and so only provides an estimate of the wildlife population at that particular time. This method is not reliable for smaller species.

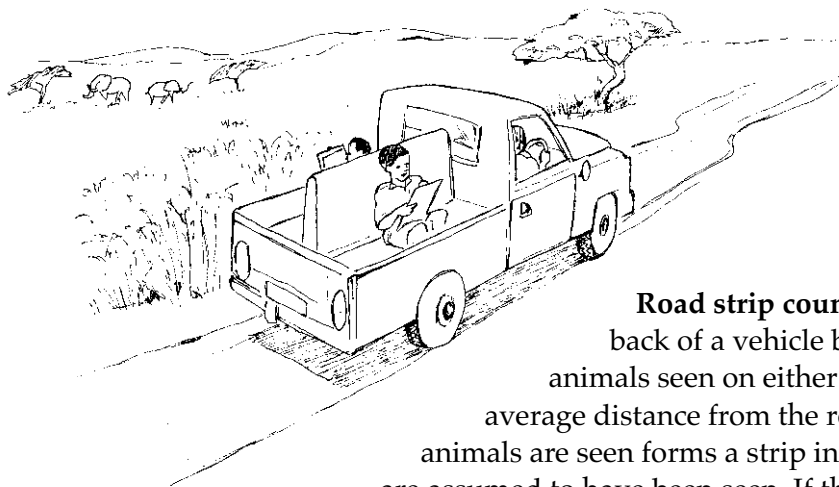


Until other methods are adopted which directly involve producer communities, districts should continue to consider an aerial survey as their best survey option for estimating the numbers of selected large animal species.

- **Ground-based methods**

Walked transects are lines or strips of a limited size that are walked by a person or group of people counting animals as they go. Ideally, three people walking in an extended line conduct this exercise. The routes of the transects can be either fixed or changed for each count. Walked transects are often carried out several times a year, usually during the dry season. Since they are carried out by members of the community they are inexpensive and also serve to raise the level of community awareness about wildlife.





Road strip counts are made from the back of a vehicle by counting the animals seen on either side of the road. The average distance from the road in which the animals are seen forms a strip in which all animals are assumed to have been seen. If the length of this strip is known the area of the strip can be calculated.

If we assume that the number of animals is the same inside and outside the strip for the same area, we can then make an estimate of the animals outside the strip. Road strip counts are usually conducted once a year because of the large amount of field work and analysis that is required.

Road strip counts have more disadvantages than advantages. They need a vehicle and passable roads to carry out the census. Interpreting the results may also need the help of a specialist. Hence they are relatively costly.

Advantages of ground based methods

- are cheaper than aerial surveys,
- easier to do
- are more reliable for small animals which can only be seen when close up.
- can involve communities more.

Are there any disadvantages for using methods that rely on a sample?

Any method that relies on a sample assumes that animals are spread evenly throughout the total area. Obviously this method can be inaccurate since everyone knows that wildlife concentrates in certain areas where there is food, water or shelter. Animals move and it is difficult to be sure that you have not counted an animal more than once. In practice, since the size of the area that has been searched is not exactly known, it makes estimates of total population size imprecise. For all these reasons sample counts are usually used with other methods which provide indications of what is happening to the population size.

What indicators can we use to estimate what is happening to the population?

Indicators do not allow us to work out the total population size, but they provide 'indices' or numbers that give us a sign of how populations are changing. There are several ways to count and classify animals that may help us to understand how the population is surviving.

- **sample counting over a small area**

This is easy to do and tells us how frequently animals occur. The numbers of animals seen per unit of time or over a particular distance is counted. Comparing this with previous counts will show changes over time or trends, as well as the relative size of different

Table 5: Impala counted in one hour in Chilazi from 1993 to 1995

	July 1993	July 1994	July 1995
No. of impala counted	40	50	60
Increase in population size	50% over two years		

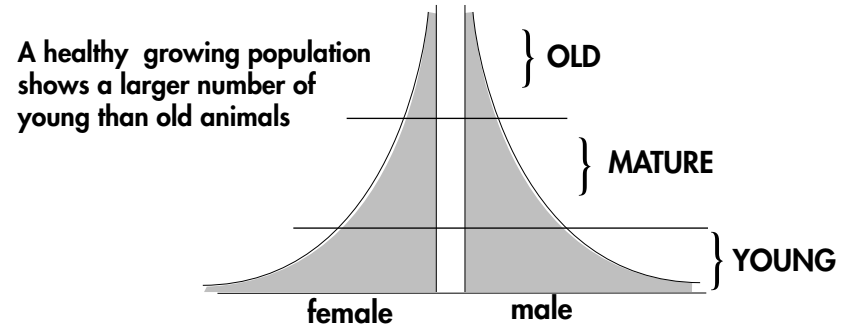
populations of species. The results are usually expressed as numbers of animals against time (minutes or hours) or distance (meters or kilometres).

In the above example, while the total population size is not known, we can see that the population size has gone up by 50% in two years. If the same trend is confirmed by other indices, then a community might wish to introduce or enlarge its impala cropping quota.

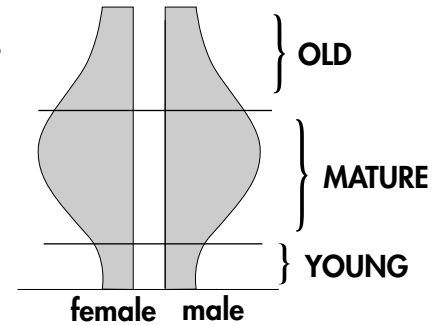
This year I've counted 60 impala in 1 hour - Last year I counted 50 in 1 hour - and the year before I counted 40 impala in 1 hour.



AGE STRUCTURE PYRAMIDS

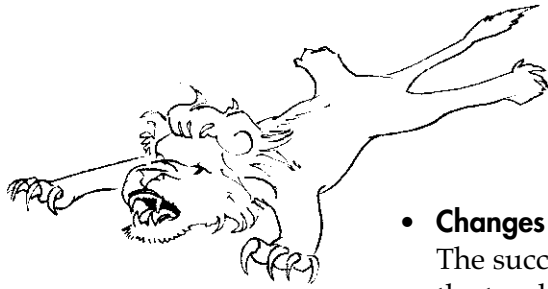


An unhealthy declining population has a smaller number of young animals

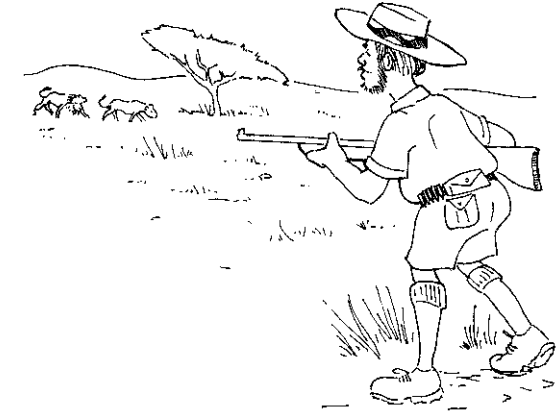
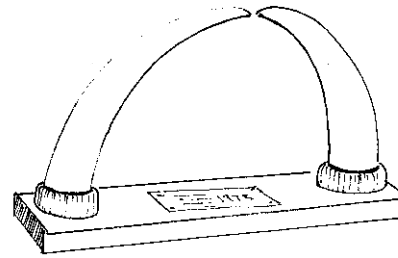
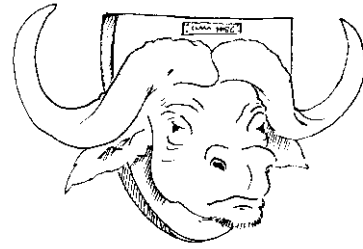


- Comparing the change in sex and age composition**

Counting animals and classifying them by age and sex provides important information. In a healthy population there should be animals of all age classes. It may also be important for us to know how many old males there are in a population if we wish to sell part of the quota for trophy hunting. Or, if we want to increase the number of animals in order to crop for meat, we need to know how many young females there are.



Trophies can be horns, tusks, skins or body mounts depending on the animal



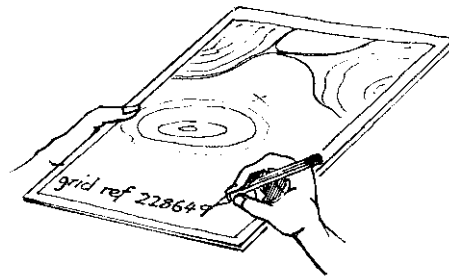
- **Changes in trophy quality**

The success of a hunting safari is based on the sizes of the trophies killed in the area. Trophies are measured by their length in the case of horns, weight in the case of ivory and body length in the case of lions and leopards. If there is too much hunting, this will cause a decline in trophy quality.

In some cases trophies are selected for their age rather than horn length alone, in which case old animals with worn horns are killed. With elephant, ivory tusks grow throughout their life only decreasing in weight if they are broken. It is very important that districts should record and keep the measurements of all the trophies shot in their area.

- **Recording the location of a kill**

This is not only important in order to distribute revenue accurately, but also helps us to build up a picture of where the hunted animals are found. This can help us to plan where other activities should take place in the ward and district.



- **Problem animal reports**

These can indicate where elephant and possibly other species such as lion and leopard may be found.

- **'Hunting effort'**

The amount of time hunters spend hunting and the numbers of animals killed is called the 'hunting effort'. Although it is difficult to measure because many species are hunted at the same time, the overall amount of time (in hours) or days used compared to the animals killed provides an 'effort/kill' ratio. An increase in effort to kill a particular species of the same quality may indicate that the population is declining.

- **'Encounter rate'**

The number of times a hunting group comes into contact with an animal of the species being hunted gives us an 'encounter rate'. This information can often be supplied by scouts and hunters from their diaries. Districts should try to collect this information annually.

- **'Hunting success rate'**

This is the percentage of the allocated quota taken over successive seasons. If the whole quota for a species is shot then it is easy to assume that there are plenty of trophy class animals. However, it needs to be clearly established that the shot animals were in fact trophy class, e.g. more than 75% trophies. If only a part of the quota is shot then it may indicate a shortage of trophy animals. However, low hunting success rates may be due to other factors such as low hunting skill or the safari operator's failure to market all of the quota. We need therefore to check this information against the hunting effort indicated.

- **Observations of safari operators**

Safari operators generally cover most of the hunting area and can indicate where wildlife is abundant or scarce.

- **Local knowledge**

The knowledge of villagers who move through areas of wild land should also be sought. Some communities have hunters within them who could be employed to collect information. Even '**poachers**' can provide useful information about where there is wildlife and in what quantity or be trained to use their skills as a wildlife monitor.

- **Maps drawn by communities**

These can indicate approximate numbers and the locations of animals. This is most useful for species which occur in distinctive herds or localised areas and are easily seen.

Further details about these methods and the training that is required to implement them can be found in the quota setting trainers toolbox.

How can we use this information?

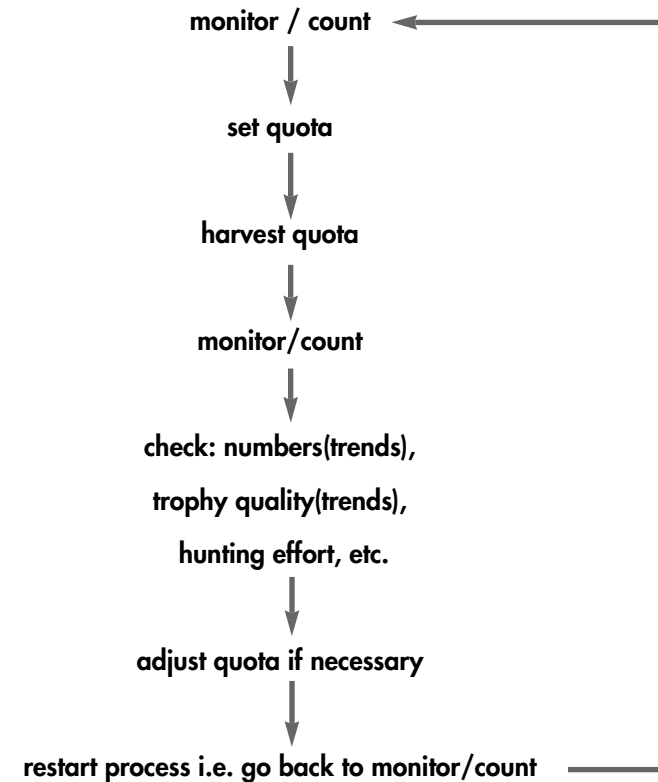
In order to build up an accurate picture about what is happening to wildlife in a district, we need to use more than one source of information. A useful term for comparing the information from several sources to check if they all indicate the same, is called '**triangulation**'. We need to use as many sources of information as possible about wildlife because no single method will give us a totally reliable picture.

For example, counting animals is difficult and produces information which can be inaccurate. Small animals are usually missed in aerial surveys while they are easily seen during a ground based one. Therefore, estimates from these two sources may be conflicting. This is where we may need to include other sources of information, such as trophy size and the observations of villagers and the safari operator, to try and establish what is really happening.

Let us take the example of a district with some wildlife, that wishes to begin to manage this resource. Initially, the district needs to know what wildlife is present, so it pays for an aerial survey and involves the community in a ground counting exercise to provide an indication of how many animals are seen over a certain area. Community mapping method may also be used to determine an estimate and the distribution of the animal species.

Using this information an initial quota is set. The quota is harvested and the district again uses an aerial survey together with other indices to see what is happening to the wildlife population. This time a wider range of indices such as trophy quality, encounter rate and hunting success rate are available to the district. The information provided by these indices provides a check on whether the original quota was set too high or possibly too low. If necessary the quota is adjusted before the next harvest. After the harvest, again counting methods and indice methods are used to find out what is happening to the population. This process of continual monitoring allows a council to reconsider the quota and adjust its management decisions both in the light of its own objectives and any changes taking place in the wildlife population. This process is called '**adaptive management**' and is shown in the diagram to the right.

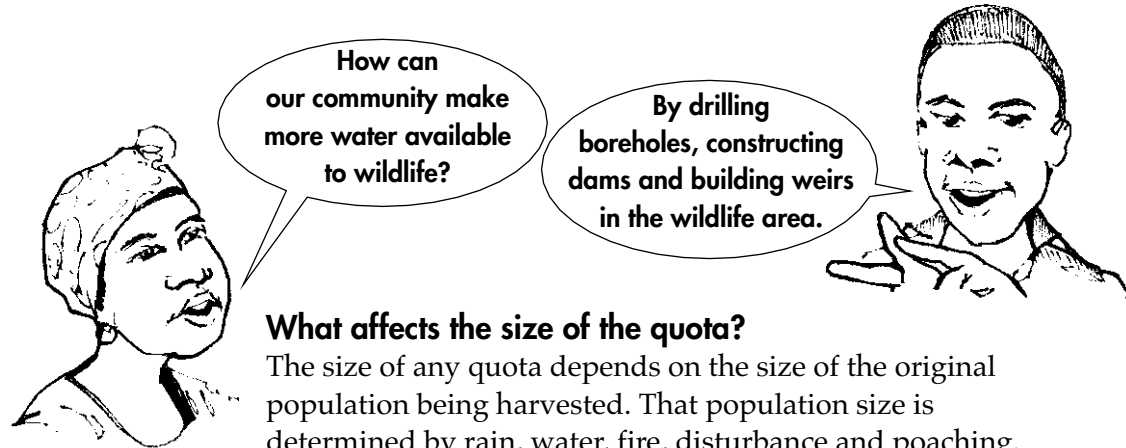
The Adaptive Management Process



Measuring buffalo trophy quality at the Nyaminyami District Quota Setting Workshop.



Photo Ivan Bond (WWF)



What affects the size of the quota?

The size of any quota depends on the size of the original population being harvested. That population size is determined by rain, water, fire, disturbance and poaching. Some of these factors can be influenced by the community while others obviously cannot.

Who determines the quota?

The long term aim of the programme is for villagers themselves to make choices about the quota. CAMPFIRE principles suggest that the unit of management should be the unit of benefit and authority and that this group of managers should be small and transparent - for example a VIDCO. Presently, districts and wards are developing their capacity to both set and allocate a quota. Final approval however is still required from DNPWLM.

What choices do communities have?

A quota can be used in a number of ways. A community needs to compare the costs and benefits of these choices and to make a final decision in relation to the objectives which they feel are most important .

- **Choice 1: Safari hunting:** Animals are killed by foreign clients with safari operators. This is usually the most financially profitable way of using animals.

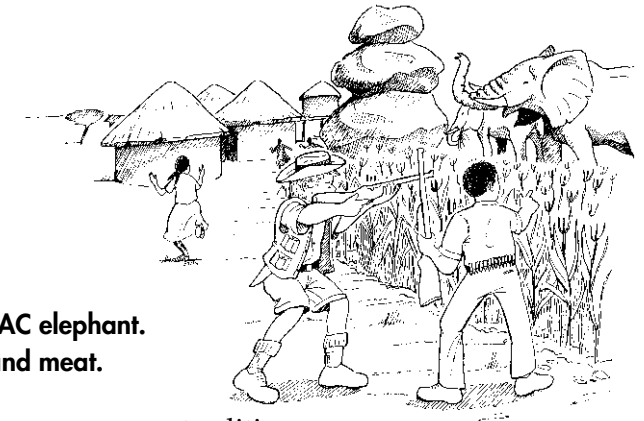
- **Choice 2: Cropping or culling for meat:** Animals can also be killed for meat, but the amount of money from this use is usually small. While with safari hunting the community can get both meat and money the amount of meat is often less and may be donated to a community nearest the kill site rather than equitably distributed throughout the ward. In practice, few districts have chosen this option.

One exception is where there are a large number of impala such as in Nyaminyami. The other is where elephant populations are high and they are damaging the vegetation. Several districts have been given a small culling quota to use excess elephants. When culling, whole herds must be killed. This is because with elephants, the herds are led by large females called matriarchs. If only these large animals were killed, the herd would be left without leadership which would cause social problems. Similarly selecting and shooting only the females with large tusks is not done because it results in future generations of elephant having smaller tusks which are worth less money.





Shooting a PAC elephant by a DNPWLM official/ranger or professional hunter on behalf of RDC.
Benefits: meat, skin and ivory.



Client shooting a PAC elephant.
Benefits: revenue and meat.

- **Choice 3: Problem animal control:** Animals can also be shot to protect human life, crops and livestock. (Problem animal control options are explained in greater detail in booklet 1 ‘Problem Animal Reporting’ in the WWF ‘Wildlife Management’ series). Like cropping for meat, the income from problem animal control is low. However, a number of districts have made arrangements so that problem animals are killed by clients ensuring that the community is both protected and receives some income.
- **Choice 4: Local hunting:** At the present time, animals are often killed by local people in an uncontrolled manner. This is commonly called ‘poaching’ and should be stopped. It is wasteful because animals are often left to rot in snares and because valuable trophy animals may only be used for meat. Moreover, only a few people benefit rather than the whole community. Because it is illegal, no records are kept, it is difficult to monitor and this reduces the standard of management.

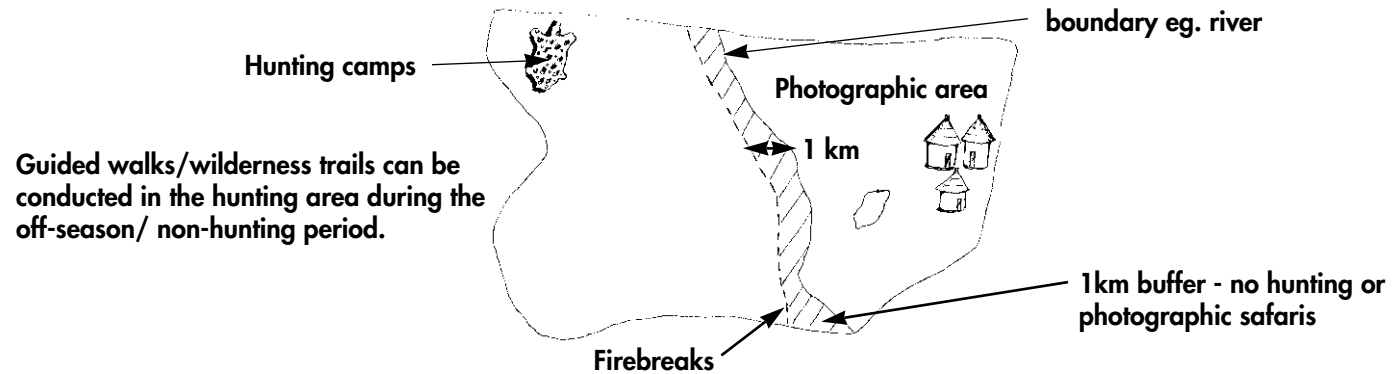
While poaching is undesirable, local people should still be encouraged to hunt a part of the quota in a controlled manner. This will encourage them to become interested

in wildlife, and in some cases may preserve traditions that are disappearing. The community should discuss which animals to use for this purpose bearing in mind the benefits that different uses of a quota can bring.

For example, the Mahenye community has proposed to form a hunting club and has established rules to control this hunting. The Shangaan tradition of using “qualified” hunters has been incorporated into the rules, and although hunters have an obligation to return the meat to the community, they are paid for it. Since the quota belongs to the district and its communities, these people are perfectly entitled to allocate a part of the quota for their own use.

- **Choice 5: Live sales:** Wildlife enterprises such as game ranches and tourism operations are expanding throughout Southern Africa. These businesses often want to restock their wildlife. They want to buy whole herds, especially females because they want these species to breed on their land. Before deciding to capture and sell live animals, you must investigate the current prices for capture and sale. Prices change with demand and for some species live sales may not be profitable. Also be sure of rules and regulations regarding wildlife sales and movements.

LAND USE PLAN FOR BOTH PHOTOGRAPHIC AND HUNTING SAFARIS



Councils should remember that it takes a lot of organisation to catch animals, and the capture involves the cost of hiring of a commercial firm with aircraft, mobile bomas, vehicles etc. This accounts for approximately 25% of the final sale price of these animals. The following 1997 prices are provided as a rough guideline for how much a landholder might expect to get from selling live game after the costs of capture have been paid. For current prices, councils should contact the Department of National Parks and Wildlife Management.

- **Choice 6: Non-consumptive uses:**

1997 Wildlife Compensation Values in US\$

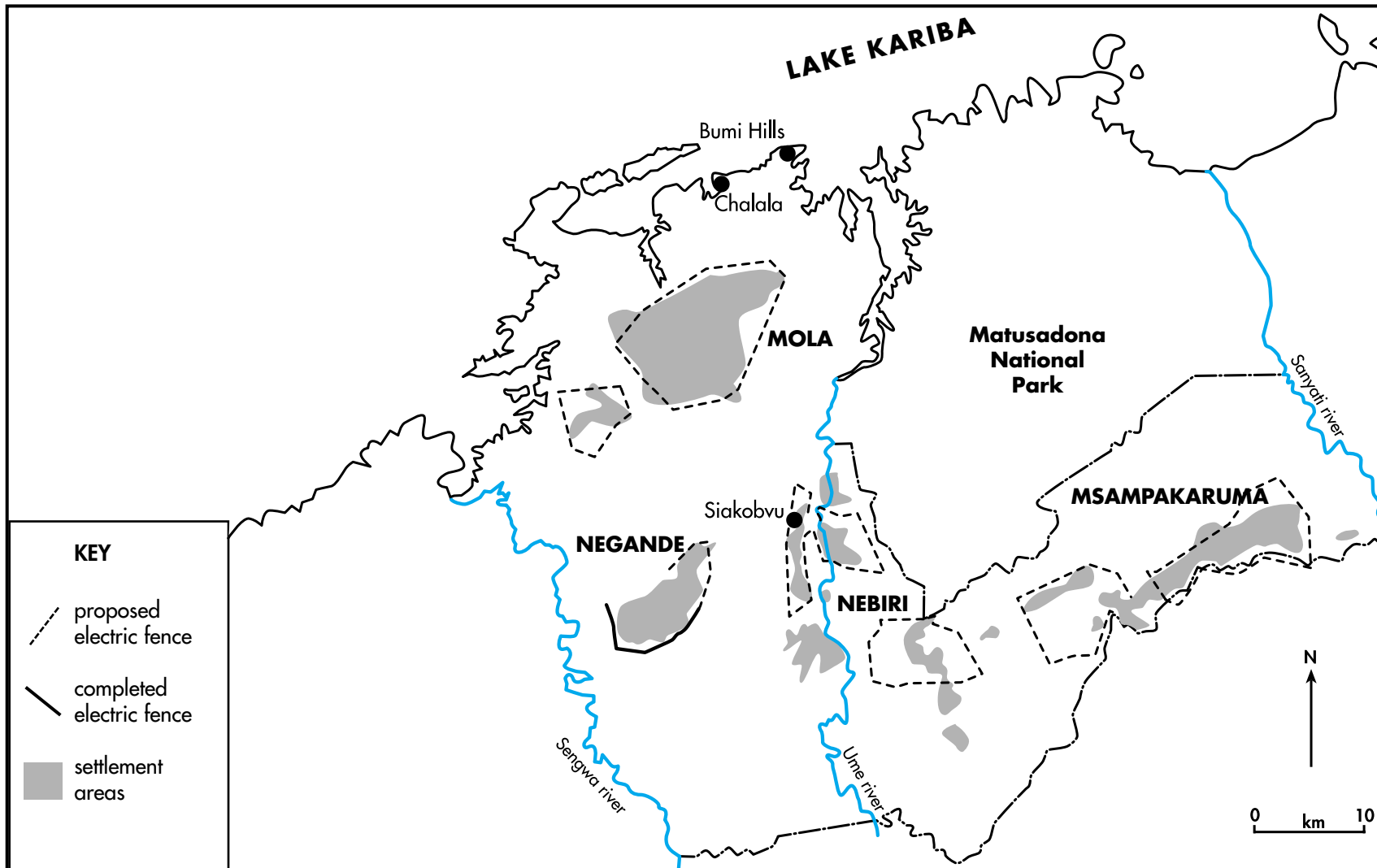
Elephant (M)	8,500	Crocodile	1,100
Buffalo (M)	1,000	Sable	1,800
Lion	3,000	Eland	1,500
Leopard	1,800	Kudu	600
Hippopotamus	1,000	Impala	50

Animals can be used without killing them. The main example of this is photographic or game viewing tourism. In areas of good wildlife resources, some districts have formed relationships with commercial tourist operators to build lodges and with good negotiation, these can generate a lot of money. However, they are only possible in areas with excellent wildlife, where elephants, lions, leopards and buffalo can be seen regularly.

Because no animals are killed, they will not use up any of the quota. With careful zonation as the above diagram shows, it is often possible to use the same animals to generate money from both hunting and photographic safaris.

In the above illustration care should be taken when deciding on the zonation. A detailed study of the species, distribution and movements should be conducted. The area set aside for photographic safaris should be one with a high species density and diversity for most of the year.

The Omay Communal Land, Nyaminyami District, Kariba showing settled areas in Mola, Negande, Nebiri and Masampakaruma chieftainships



Background to the Omai Communal Land

The Omai Communal Land supports most of the wildlife populations in the Nyaminyami District in Kariba. The area covers 2, 870 sq km and has a population of about 20 000 people centred around the four chieftainships of Mola, Negande, Nebiri and Msampakaruma.

Because of the presence of tsetse flies, in the past goats were the only livestock kept by the community. The hot and dry climate with rainfall averaging around only 500mm also limited the area devoted to cropping. As a result the Omai still has large areas of wild lands which provide a home for a variety of wild animals.

Although the Omai has been used for international safari hunting for the past 20 years, only since Appropriate Authority was granted in 1989 have revenues been returned to the council. Until recently a quota for using the wildlife was set by DNPWLM with little local consultation or involvement.

Increasingly however, Nyaminyami RDC has taken responsibility for monitoring its wildlife resources, consulting local communities and recommending a quota to DNPWLM for approval. This process has resulted in a District Quota Setting Workshop, in Siakobvu in November 1995.

Who attended the workshop?

About 35 participants attended representing ward CAMPFIRE committees, Nyaminyami RDC executive officers, traditional leaders, safari operators and technical advisors. WWF facilitated the quota setting process.

What areas did the workshop cover?

The workshop had two main objectives; to allow participants to learn about quotas, aerial surveys and trophy quality through participating in a series of activities and secondly to review wildlife data in order to set a quota for 1996.

What data about wildlife was used to develop the quota?

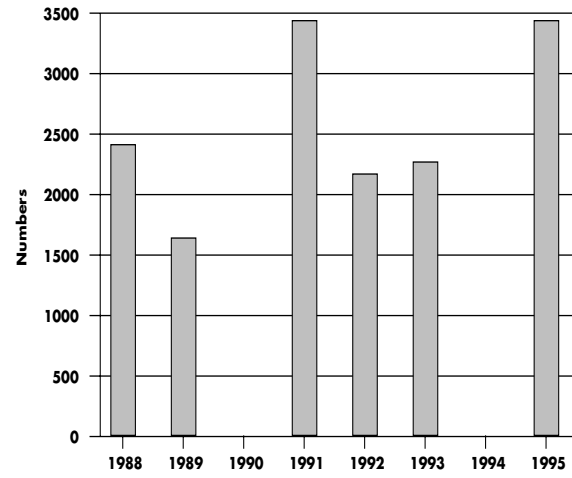
Participants were provided with the aerial survey results for the larger game species between 1988-95.

Aerial survey results for the Omai Communal Land 1988-1995

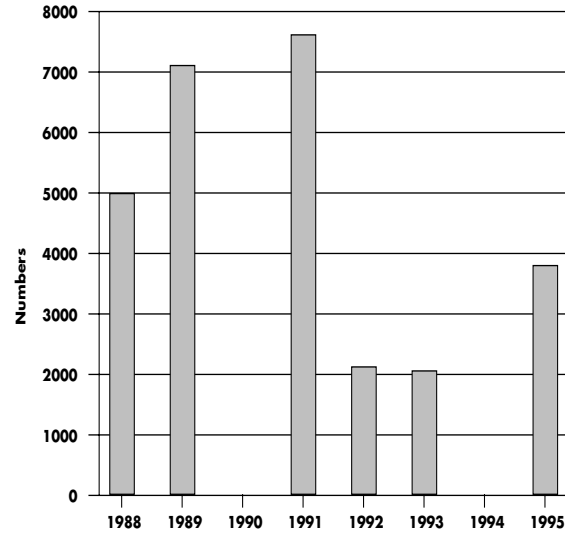
Species	1988	1989	1990	1991	1992	1993	1994	1995
Elephant	2,407	1,713	n/s	3,442	2,158	2,324	n/s	3,445
Buffalo	4,953	7,125	n/s	7,504	2,258	2,044	n/s	3,703
Impala	15,513	12,129	n/s	6,139	5,659	5,412	n/s	2,547
Sable	192	316	n/s	789	648	401	n/s	140
Waterbuck	595	463	n/s	1,091	697	858	n/s	862
Zebra	1,056	665	n/s	725	865	377	n/s	349

n/s = no survey

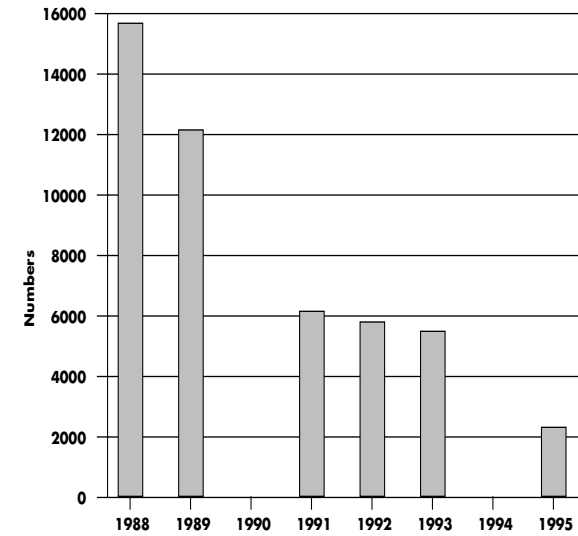
AERIAL SURVEY ESTIMATES



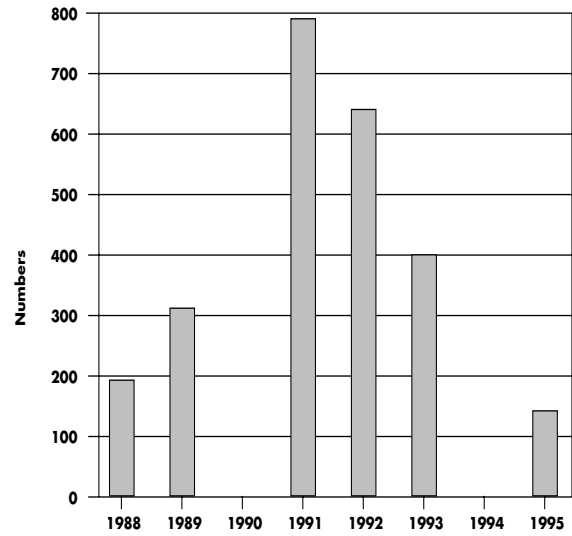
ELEPHANT



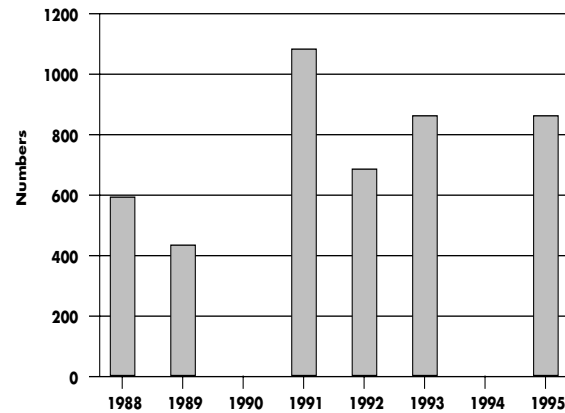
BUFFALO



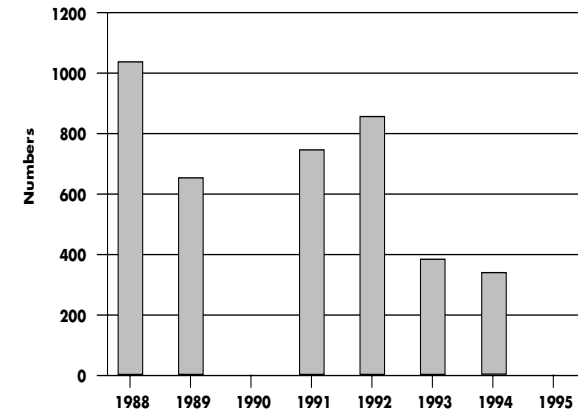
IMPALA



SABLE

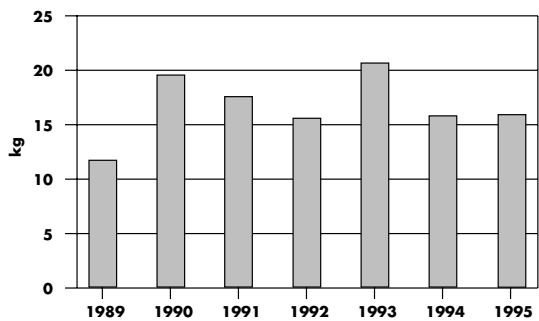


WATERBUCK

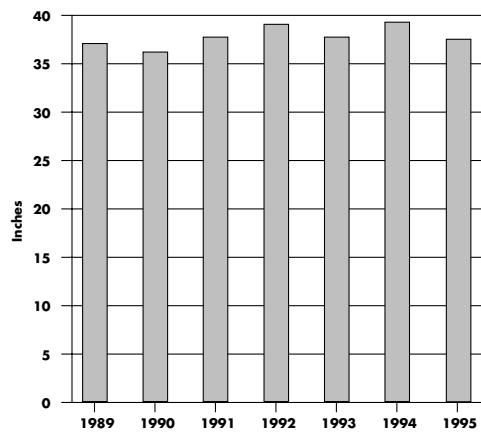


ZEBRA

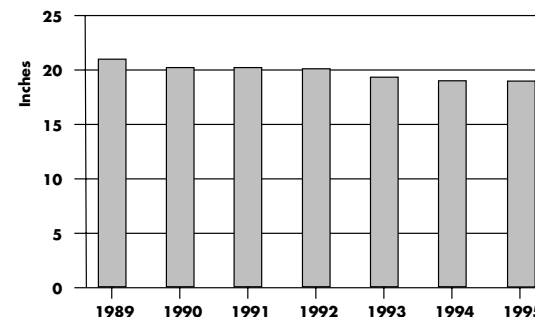
TROPHY QUALITY



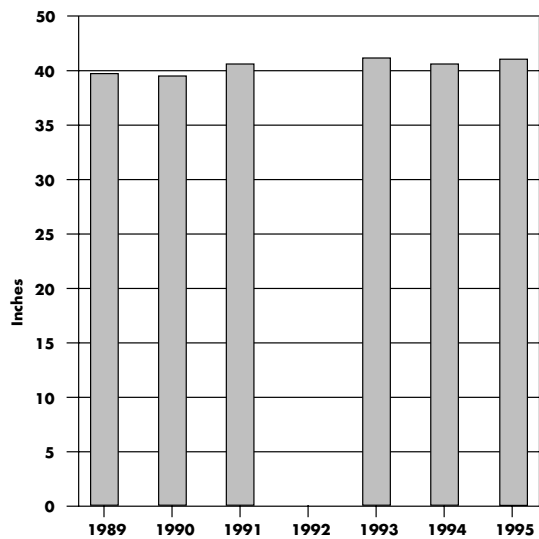
ELEPHANT



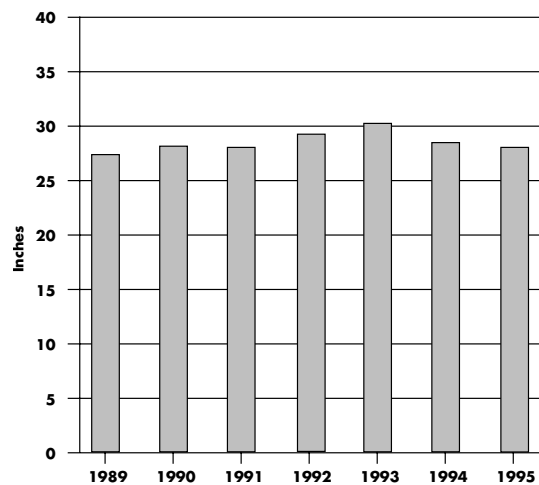
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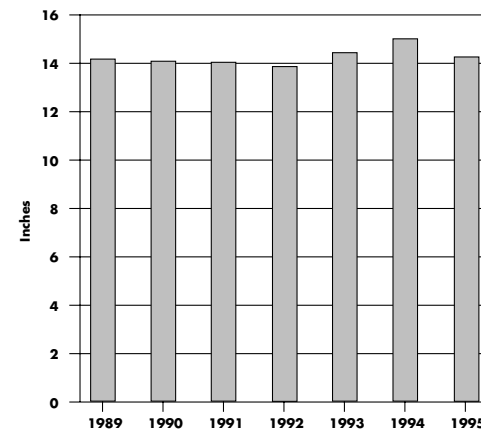
IMPALA



SABLE



WATERBUCK



BUSHBUCK

They also calculated trophy data for elephant, buffalo and impala and had access to similar data for sable, waterbuck and bushbuck.

**Trophy quality for key species in the Omay Communal Land
(all recorded trophies)**

Species	1989	1990	1991	1992	1993	1994	1995
Elephant (kg)	11.99	19.81	18.37	15.69	20.7	16.5	16.3
Buffalo (inches)	37.49	36.89	37.78	38.63	37.76	38.75	38.15
Impala (inches)	21.33	20.24	20.25	20.15	19.57	19.27	19.27
Sable (inches)	39.46	39.19	41.50		43.05	41.6	42.75
Waterbuck (inches)	27.62	28.16	28.14	29.08	30.38	28.44	27.96
Bushbuck (inches)	14.33	14.18	13.96	13.80	14.68	15.23	14.48

From this information it was possible to establish whether the population size and trophy quality was increasing, stable or decreasing for each species. These trends were visually represented on the triangulation table (see opposite page) for each species. The triangulation table also visualised the impressions of both the safari operator and the community about population size changes and the level of poaching. Using the triangulation table, participants discussed what changes should be made to the 1995 quota for the 1996 hunting season.

How was the data used?

Participants found it important to discuss, compare and cross-check data from all different sources before coming to a final decision. The most important species of wild animal was discussed in turn. Some of the observations are noted here.

- **Elephant bulls**

Although aerial survey results indicated a possible increase in population, trophy quality was stable to declining while participants indicated that poaching could be reducing elephant numbers. So it was decided that the quota should remain at 20 bull elephant, 12 for sport hunting and 8 for PAC.

- **Buffalo bulls**

The aerial survey and trophy quality data indicated a fairly stable buffalo population. The safari operators agreed with the assessment and the quota was maintained at 110 bulls, 10 of which were reserved either for PAC or cropping. Everyone agreed that buffalo were being poached heavily and it was noted that if there was no reduction in this poaching, the quota would have to be reduced in the future.

Quota Sheet 1996: Omay Communal Lands
The proposed 1996 hunting and cropping quota for the Omay Communal Land

Species	1995 Quota	Aerial Survey	Trophy Quality	Safari Operator	Community Poaching Information	1996 Quota	Comment
Elephant Bulls	20	↑ ↔ ↓	↔ ↓	↔	↑	20	8 PAC
Elephant Cows	6	↑ ↔ ↓		↔	↑	10	10
Buffalo Bulls	110	↔	↔	↔	↑↑↑	110	10 PAC or cropping
Buffalo Cows	40	↔		↔	↑↑↑	40	
Lion	8			↓	↑	6	
Lioness	2			↓	↑	2	PAC only
Hyaena	8			↑		4	
Crocodile	6		↔	↑	↔	10	Population seems to be increasing
Sable	8	↔ ?	↔	↔	↔	10	
Bushbuck	32	?	↔	↔	↔	32	
Waterbuck	30			↓	↑	30	
Impala Male	910	↓ ↓ ↓	↓	↓ ↓	↑ ↑ ↑	160	Trophy only
Impala Female	790	↓ ↓ ↓			↑ ↑ ↑	40	Trophy only

Key to Table		
↑ : population increasing	↔ : population stable	↓ : population decreasing
		? : population changes unknown

- **Lion**

The safari operators indicated a decline in the number of lion and participants agreed that lion were being killed illegally. So the quota was reduced from 8 to 6. Similarly although 2 lionesses were maintained on the quota, it was agreed that these were only to be shot if necessary as PAC animals and could not be used for sport hunting.

- **Hyena**

Participants agreed that the number of hyena in the area was low, so the quota was reduced from 8 to 4.

- **Crocodile**

Participants noted that there was a healthy crocodile population on the Sengwa river, so the quota was increased from 6 to 10.

- **Impala**

Aerial survey and trophy quality results indicated a decline in the impala population. The safari operators agreed with this and participants noted that there had been large increases in 'poaching'. While there were many requests to reduce the total number of impala on quota, because of the importance of impala meat it was decided that further investigation be carried out before setting a cropping quota. In the meantime the sport hunting quota of 160 males and 40 females was maintained.

Appendix One

Addresses of organisations

WWF Programme Office

10 Lanark Road
Belgravia
P.O. Box CY1409
Causeway,
Harare
Zimbabwe
tel (263-4) 730599

DNPWLM

Botanical Gardens
P.O. Box CY140
Causeway,
Harare
Zimbabwe
tel (263-4) 7927873/9

Zimbabwe Trust

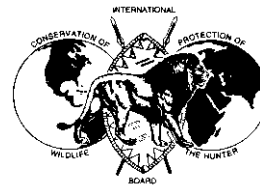
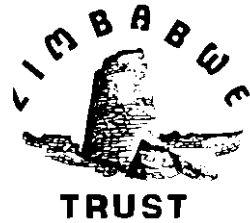
4 Lanark Road
Belgravia
P.O. Box 4027
Harare
Zimbabwe
tel (263-4) 730543

Campfire Association

Mukuvisi Woodlands
P.O. Box 661
Harare
Zimbabwe
tel (263-4) 747152

Appendix Two

SPECIES	MAXIMUM TOTAL OFFTAKE(%) FOR SUSTAINABLE POPULATION	OF WHICH SPORT HUNTING SHOULD NOT EXCEED (%)
Elephant (M)	1	.75
Elephant (F)	3	
Hippopotamus	10	5
Giraffe	7	2
Buffalo (M)	4	2
Buffalo (F)	5	3
Crocodile	2	2
Eland	10	5
Waterbuck (M)	5	2
Waterbuck (F)	5	2
Kudu (M)	5	1.5
Kudu (F)	5	2
Roan	10	2
Sable	10	2
Wildebeest	10	3
Gemsbok	10	2
Tsessebe	10	3
Nyala	10	2
Warthog	20	5
Bushpig	20	unlimited
Reedbuck	10	2.5
Impala (M)	10	5
Impala (F)	10	10
Bushbuck	10	.5
Duiker	15	5
Klipspringer	15	3
Sharpe's Grysbok	15	5
Suni	10	3
Lion (M)	6	5
Lioness	6	3
Spotted Hyaena	15	10
Leopard	15	8
Cheetah	10	5
Honey badger	15	5
Civet	15	5
Serval	15	5
Jackal	15	unlimited
Bat eared fox	15	5
Wild cat	15	5
Genet	20	10
Porcupine	20	5



Safari Club International

This booklet is the fifth in a series of guides on Wildlife Management and examines in detail in a simplified form, the various technical components of the quota setting process. It provides background information and guidance to Rural District Councils who wish to do this and should be read along with the other booklets in this series. Together they provide information and guidance in turn, to members of villages, wards and rural districts involved in the management of Campfire projects. These booklets are linked to training programmes being undertaken by members of the CAMPFIRE Collaborative Group.

Booklets in the Wildlife Management series include:

1. Problem Animal Reporting
2. Electric Fencing Projects
3. Marketing Wildlife
4. Safari Hunting
5. Quota Setting Manual

WWF is a member of the Collaborative Group supporting the CAMPFIRE programme in Zimbabwe and has provided support and training to communities in the establishment of wildlife management systems.