COUNTING WILDLIFE MANUAL

WILDLIFE MANAGEMENT SERIES

WWF®

COUNTING WILDLIFE MANUAL

The African Elephant Conservation Act under contract between the United States Fish and Wildlife Service and Safari Club International provided funding for the development and production of this manual.

These guideline booklets are based on field experience and original research reports which are available from the WWF Programme Office in Harare. WWF wishes to acknowledge the important contribution made by the Rural District Councils and their constituent communities in the development of the series. The methods presented in the manual have been tested by the Support to CAMPFIRE Project over the last five years with different communities in a number of districts and wards.

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Community participants in the 2000 annual ground count, making camp on the Ume River at Kautsiga, in the heart of the wildlife corridor.

PREFACE

INTRODUCTION TO THE COUNTING WILDLIFE GUIDELINE MANUAL

What is the objective of this manual?

In the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) rural communities participate and benefit from the management of their wildlife and other natural resources. Knowing how many animals they have and where they are found allows producer communities to effectively manage and benefit from them.

The objective of this manual is to provide an introduction to ground-based methods for counting wildlife. These methods have all been designed and tested during 1994-9 by producer communities and Rural District Councils as part of the WWF Support to CAMPFIRE Project. The manual emphasises methods which are simple, reliable and easily implemented.

How is this manual related to the Quota Setting Manual and Tool-box?

The purpose of this manual, and that of the Quota Setting Manual (WWF Wildlife Management Series Number 5) are closely related. Both these manuals aim to help rural communities sustainably manage their wildlife. Although each manual can be read on its own, it is preferable to read and use the two together.

The quota setting manual and tool-boxes assume that there are reliable estimates of wildlife numbers on which quotas can be based. This manual provides wildlife managers with information on planning and implementing ground-based counting methods which will provide these reliable estimates of wildlife numbers. In addition to the manual, the Department of National Parks and Wild Life Management (DNPWLM) and the World Wide Fund for Nature (WWF) have staff who can advise on developing counting methods.

How is this manual organised?

This manual emphasises **survey** methods which are simple, reliable and easily implemented. These methods can be refined and improved over time by the participants as they become more confident and experienced.

Chapter One examines the reasons why wildlife counting is an important activity for RDCs and wildlife producer communities. It also outlines the information that it is important for them to collect.

Chapter Two discusses the difference between total counts, sample counts and index counts in relation to wildlife, as well as their advantages and disadvantages. It then looks at several common counting methods, including **aerial surveys**, road strip counts and walked transects.

Chapter Three reviews the technical, social and financial factors which influence the most appropriate choice of a counting method for a community.

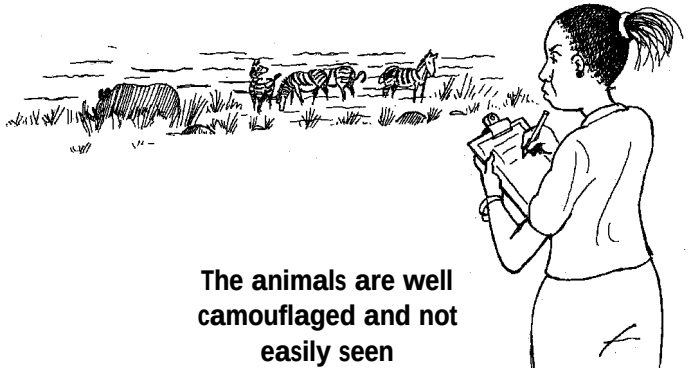
Chapter Four provides practical advice on the implementation of community-based ground counts, outlines two methods which are commonly used and explains how the data from them can be analysed, stored and used.

Chapter Five draws on the experience of ground counting in Gokwe North RDC to illustrate how an RDC can implement an effective method to count wildlife.

Finally in the **Appendices**, the reader will find a glossary containing technical words which have been included within the text and are indicated in bold (Appendix One), a description of the terms **accurate** and **precise** (Appendix Two), as well as a copy of the Transect Counting Form used in the Gokwe North RDC (Appendix Three).

The animals are wild and they cannot be herded like domestic animals

The animals may be dangerous and it is desirable not to get too close to them



The animals are well camouflaged and not easily seen

CHAPTER 1

BACKGROUND TO COUNTING WILDLIFE

Why is counting wild animals important?

For producer communities to manage their wildlife populations effectively, they need to know

- how many animals they have (the wildlife **population**);
- where these animals are found;
- when (at what time of year) they are found.

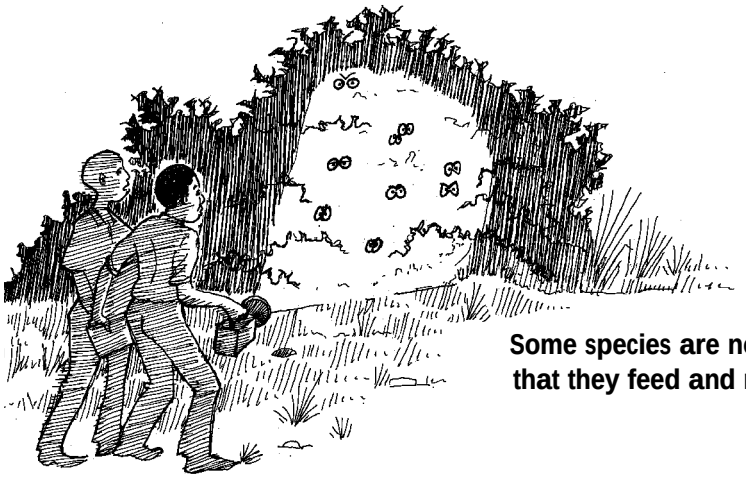
This information will improve problem animal management activities, increase the productivity of wildlife based enterprises and contribute to improved management of wildlife habitats.

Currently, the most important reason for needing to know the number and distribution of wildlife populations is so that communities can contribute their own information to the 'quota setting' process. If wildlife populations are over-hunted it will lead to a decline in number, but if they are under-used this will lead to the loss of potential income.

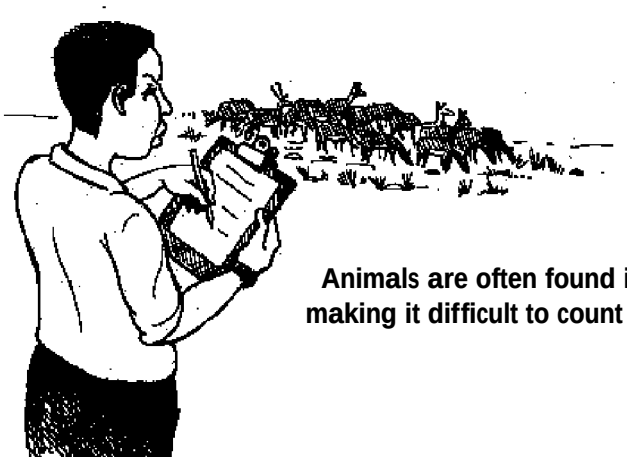
Why are wild animals difficult to count?

It is difficult to count wild animals since:

- they are wild and they cannot be herded like domestic animals
- they may be dangerous and it is desirable not to get too close to them
- they are well camouflaged and not easily seen
- some species are nocturnal which means that they feed and move around at night
- they are often found in groups, making it difficult to count individuals



Some species are nocturnal which means that they feed and move around at night



Animals are often found in groups, making it difficult to count individuals

Why is it important to count wildlife regularly ?

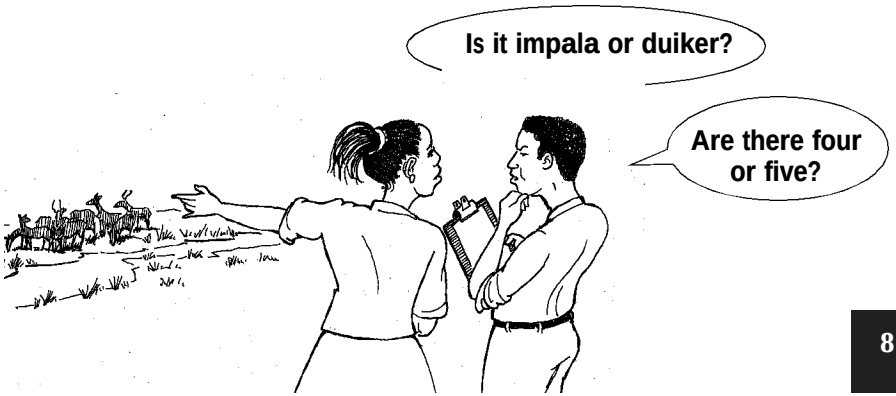
Under normal circumstances wildlife numbers do not change rapidly. Because these changes are small and gradual, we need to carry out regular counts to detect them.

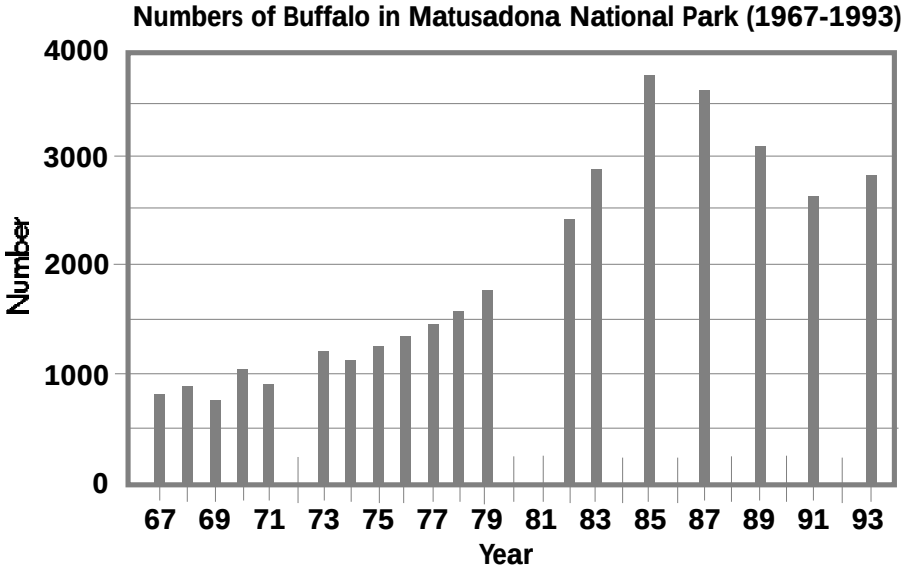
For example we need to know if the population is slowly increasing, slowly decreasing or not changing at all. Knowing this **trend** in population numbers allows us to make reliable management decisions and take corrective action when necessary.

What information is it important to collect?

When counting wild animals, it is important to record:

- the type (species and sex) of animals seen,
- the numbers of animals seen,
- when the animals were seen, (eg. the month of the year; the dry or wet season)
- by what method the animals were being counted, (eg. aerial or ground count)
- who counted the animals.





Data from long term monitoring of buffalo in Matusadona National Park shows that buffalo numbers grew rapidly in the 1970s, peaked in the 1980s and declined in the early 90s. This trend can be linked to the amount of rain, food, predation and disease.

CHAPTER 2

METHODS OF COUNTING WILDLIFE

What methods are available for counting wildlife?

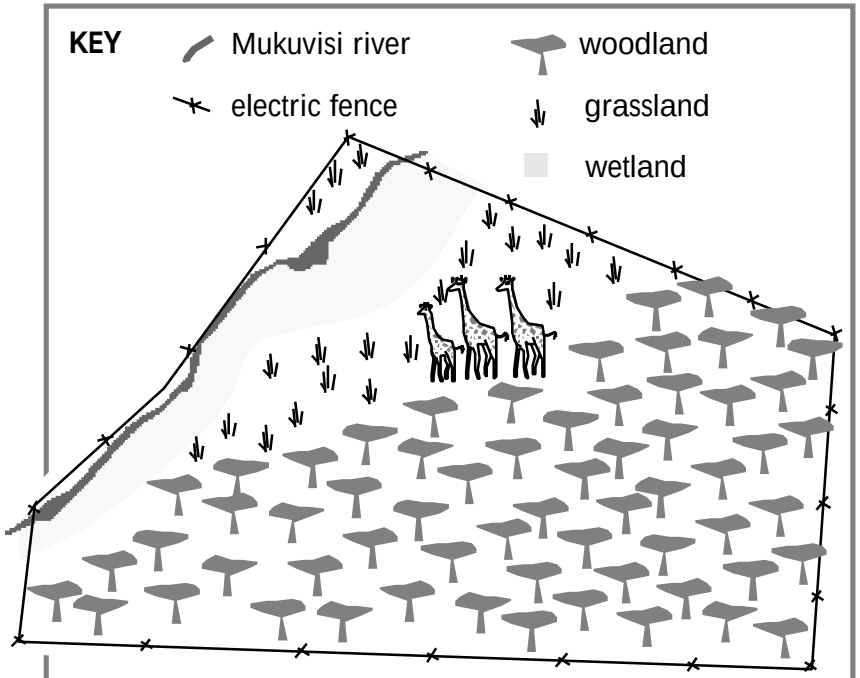
There are three main methods for counting wildlife. These are total counts, sample counts and index counts. The choice of how to do the count, whether on foot, from a vehicle or from an aircraft, will depend on the species to be counted, the size and relief of the area, the resources available and the objective of the count.

What is a total count?

A total count aims to count all the animals in a specific area. This area is called the **census** unit. It might be a National Park, District or Ward. Because of under-counting (it's unlikely all the wildlife will be seen) total counts can only provide a minimum estimate of the total population size.

Total counts should be used only when:

- the wildlife area is relatively small (under 10 km^2) and completely fenced, which means that no animals can enter or leave. For example it is possible to do a total count of the animals in Mukuvisi Woodlands, Harare.
- a single species is being counted in a restricted area. For example a total count of the hippo in the Zambezi River between Kariba Dam Wall and Chirundu.



The Mukuvisi Woodlands, Harare are less than 5 km^2 in area and completely surrounded by an electric fence. In 1997 the woodlands had 3 giraffe, while one year later they counted 4. Staff knew that the difference was a result of a calf being born. In this case a total count was the appropriate method and gave the correct result.

Why are total counts rarely used?

Other than in small or restricted areas, total counts are rarely used because:

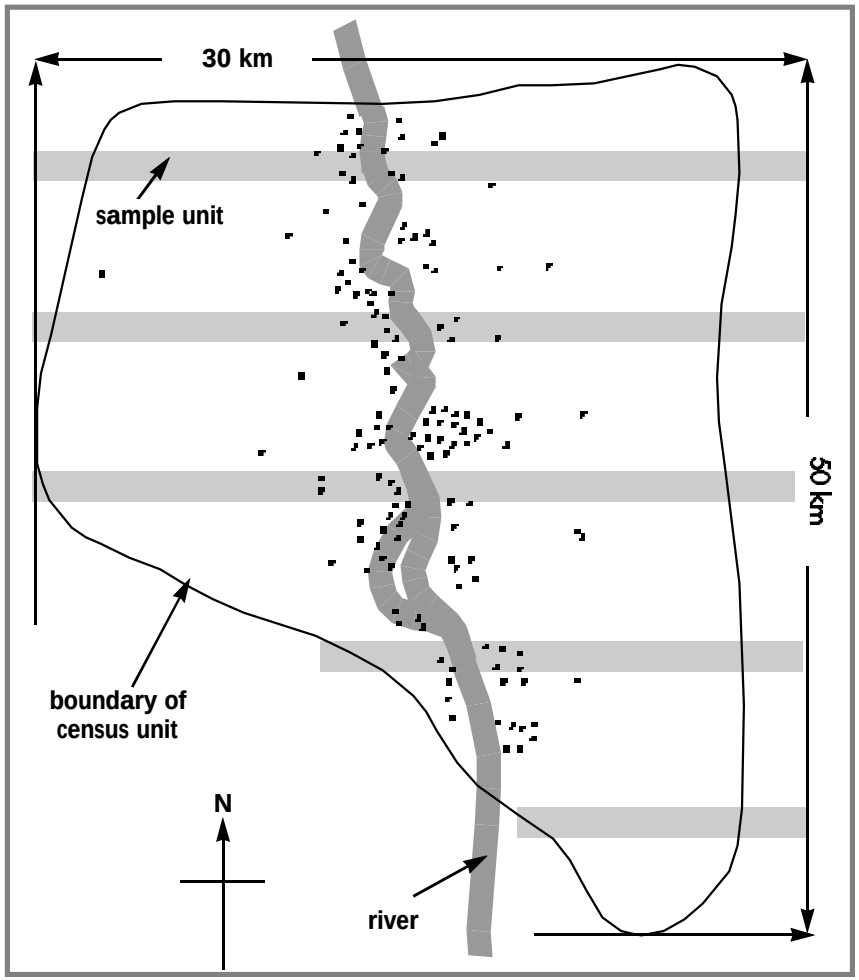
- they only provide a minimum estimate,
- the level of precision cannot be measured and,
- they are much more costly than sample counts.

What is a sample count?

A sample count aims to estimate the numbers of animals in the total area within the census units from the number counted in a smaller area (sample unit).

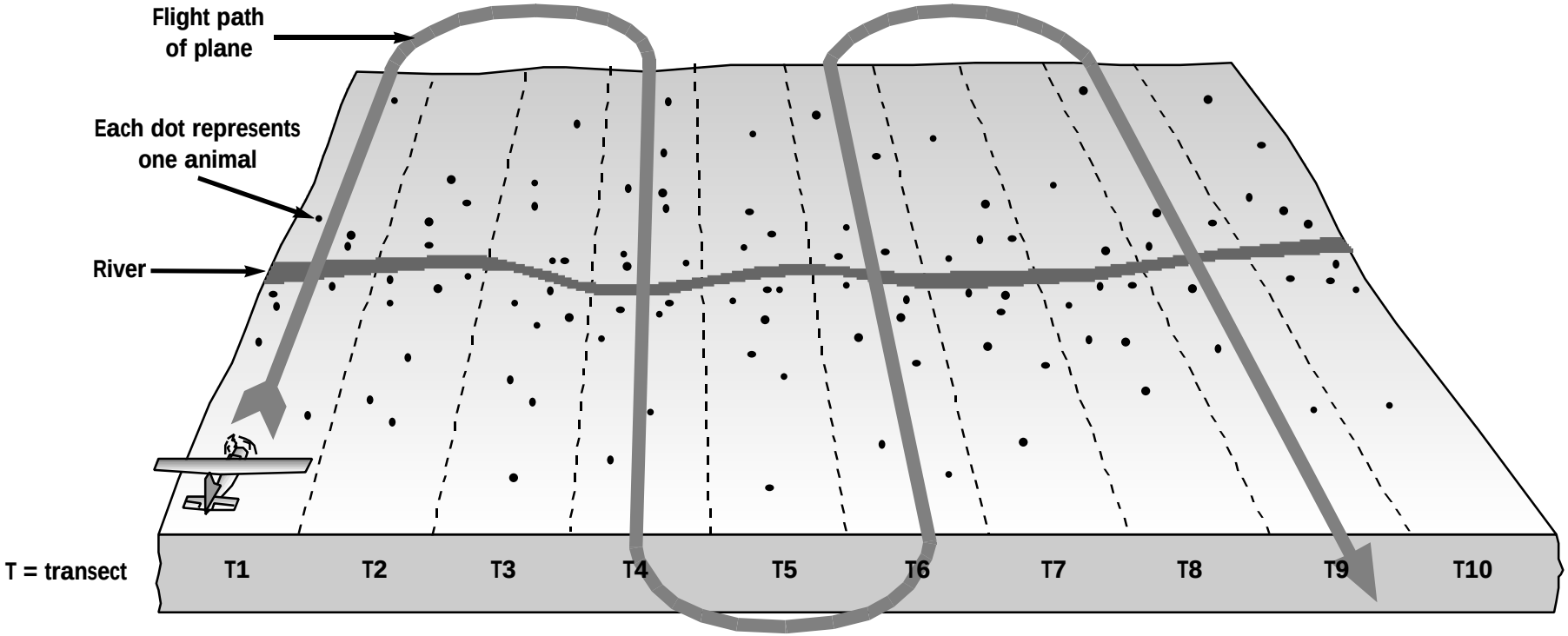
Sample counts make two important assumptions:

- that all the animals in the **sample area** or unit are seen and accurately counted;
- that animals are spread evenly throughout the whole wildlife area or census unit for which the population is being estimated.



A map showing the census unit or total area and five sample units at right angles to the river.

A base map showing sample area, transects and distribution of wildlife



How valid are these assumptions?

The extent to which these assumptions are valid, is at the root of all the problems associated with counting wildlife. It is unlikely that all the animals in the sample area will be seen and counted or that animals will be evenly distributed throughout an area. For example we know that animals naturally congregate in areas of good habitat and where there is water. So careful planning has to take this uneven distribution into account if accurate and precise results are to be obtained.

How are sample counts carried out?

Initially the total area is divided up into blocks or t**ransects**, known as **sample units**. A selection of these transects is then searched and counted. The total population **estimate** is found by multiplying the average number of animals in this sample of transects by the total number of transects across the total area.

Transect	Number of animals	Cumulative Total	Sample mean
1	9	9	
4	14	23	
6	12	35	
9	7	42	42/4 = 10.5

In the example on page 11 the sample area has been divided into 10 equal sized transects. Each dot represents an animal. A sample of four transects, in this case randomly chosen, gives a total of 42 animals counted. (see table above)

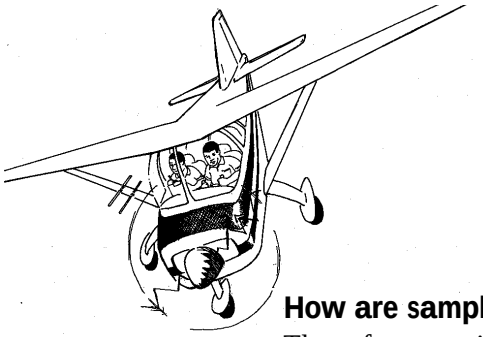
The average number of animals over the four transects, called the **sample mean**, is 10.5 animals. Therefore over 10 transects the estimated total population is 10 x 10.5 or 105 animals.

As animals are never distributed evenly within the sample area, each transect differs in the number of animals it has. This means that a number of different total population estimates can be obtained, depending on which transects are actually counted. If a further set of 4 transects is counted, a number that is higher or lower than the true number of 105 animals present will emerge (see diagram on page 11). The greater the number of sample transects, the closer the estimate will be to the true number.

What factors affect the accuracy and precision of sample surveys?

Anything which affects the distribution of animals or their likelihood of being counted will affect the accuracy of the sample:

- visibility of animals. The results of sample surveys are more accurate for large, dark bodied animals such as elephant, buffalo and sable, which are easily seen.
- type and state of habitat. It is more difficult to carry out sample surveys in hilly or mountainous areas. Sample surveys are normally carried out in the dry season when animals are easier to see because the trees will have lost their leaves.
- animal behaviour. Sample surveys of animals found in large herds can be inaccurate, as they are not easily counted.
- distribution of habitat. Wildlife is usually found where there is food, water and shelter. So the survey needs to sample all types of habitat equally.



How are sample surveys carried out?

Three factors will determine how to carry out a sample survey:

- the size of the wildlife area
- the kind of habitat
- the resources (human and financial) at your disposal

In very large wildlife areas (usually more than 1000 km^2) the only feasible method of undertaking a sample count is from an aircraft. Even though it is a sample count, it will be very expensive because of this. In areas where there is a strong element of community involvement in natural resource management, sample surveys may be carried out on foot.

What is an index method?

An index method aims, by using a standard approach, to produce an indirect measurement of the status of the population in the total area. For an **index** to provide useful management information, data for it must be collected repeatedly over a period of time using exactly the same method each time.

What types of index methods are commonly used?

Four types of method or **index** are commonly used:

- **an index of abundance** gives an indication of the status of an animal population based on the numbers of animals seen per unit of time or distance, in a particular area over several seasons.

An example of an index of abundance

In Chilazi District there is a transect in the Jenge wildlife area. Each month (except in December and January because of farming activities) John Moyo, the chief wildlife monitor and one other monitor walk from Kaswiswa to Karonga via Ndepa.

They leave in the early morning and follow exactly the same route. They count all the animals they see from the path. They have been doing this since 1993. The results are given in the table below.

Year	1993	1994	1995
Transect or route	Kaswiswa to Karonga via Ndepa	Kaswiswa to Karonga via Ndepa	Kaswiswa to Karonga via Ndepa
Number of times per year	10 (no walk in Dec and Jan)	10 (no walk in Dec and Jan)	10 (no walk in Dec and Jan)
Average number of impala seen	40	60	80

John Moyo has noticed that the average number of impala seen each year has increased from 40 in 1993 to 80 in 1995. From this he thinks that:

- the number of impala in the Jenge wildlife area might have doubled, and
- there are at least 80 impala in the Jenge wildlife area.

However because he did not know:

- the distance of the animals from the transect, or
- how long the transect is, or
- how big the Jenge wildlife area is,

he is unable to estimate the total number of impala in Jenge.

- **an index of trophy quality** gives an indication of the status of the population, based on the annual average trophy size of a given species in a particular area over several years. The WWF Quota Setting Manual No.5 in this series has more details about this.

An example of an index of trophy quality

John Moyo, the chief wildlife monitor of Chilazi District has not only recorded the number of animals shot on the quota but also the weight (in kilogrammes) of both tusks from all the sport hunted male elephant in Jenge Wildlife Area.

Year	1993	1994	1995
Number of elephants on the quota	**12**	**12**	**12**
Number of elephants shot	**12**	**12**	**11**
Average tusk weight (kg)	**21**	**20**	**19**

Since 1993, the average weight has decreased slightly. From this information John Moyo concludes that the number of trophy male elephant in the Chilazi District Wildlife Area might be declining.

- **an index of 'hunting effort'** gives an indication of the status of the population, based on the average time taken to find and shoot an animal. If over several years it regularly takes longer to find and shoot a trophy animal this might indicate a decline in the number of trophy animals available.

- **an index of 'hunting success rate'** gives an indication of the status of the population, based on the percentage of the allocated quota which is hunted over several years. If the entire quota is shot every year this implies that there is no shortage of trophy class animals. If the quota is not fully used this might mean that there is a shortage of trophy animals and the problem needs further investigation.

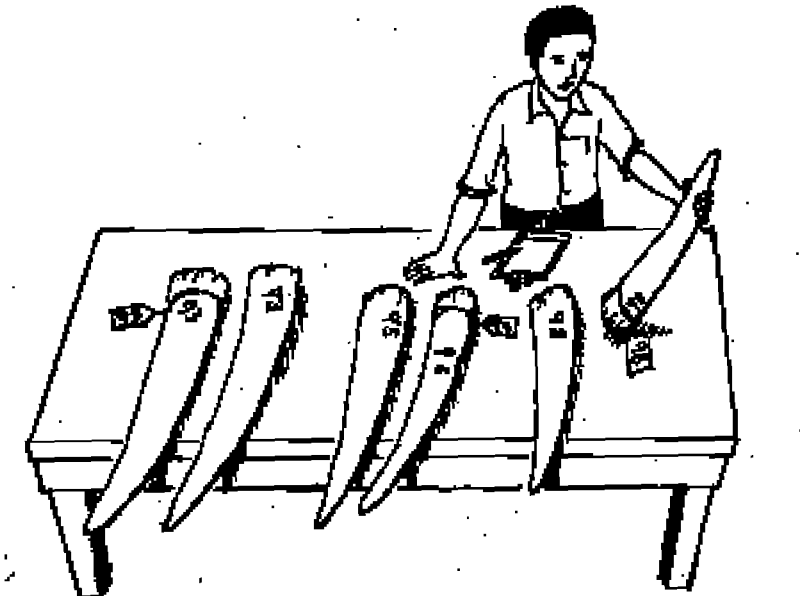
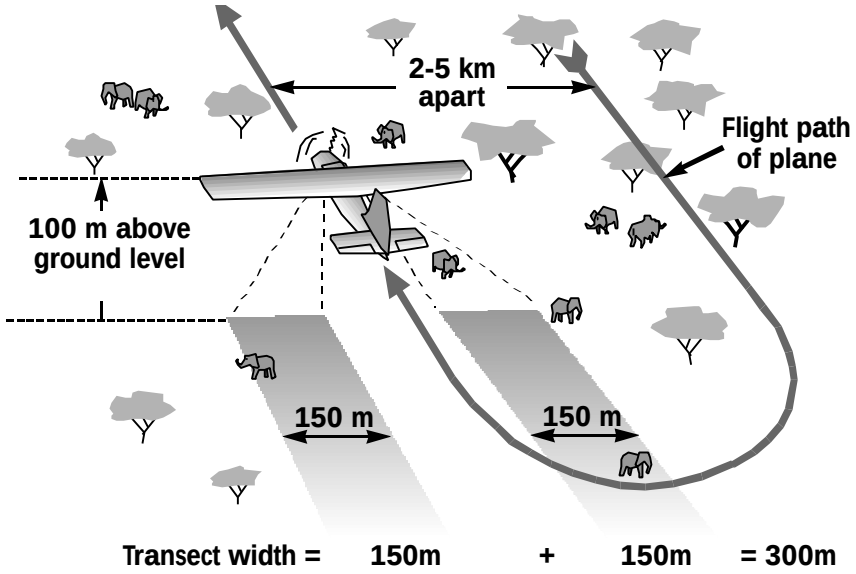


Diagram of a sample aerial survey



Why are index methods important?

Index methods or indices are important for establishing trends in populations over time. As long as the method used to collect the data is consistent, indices are technically acceptable. The data for many indicators is relatively easy to collect and the costs are relatively low. So, index methods are affordable for ward wildlife committees and / or district councils.

How are sample surveys done?

There are three common ways of doing sample surveys, these are:

- by aircraft - aerial surveys,
- by vehicle - road strip counts, and
- by foot - walked transects.

They are examined further as follows:

- where and when the different ways of doing sample surveys are used,
- how they are carried out, and
- what their advantages and disadvantages are.

Where and when are aerial surveys used?

In Zimbabwe aerial surveys are carried out by trained staff from DNPWLM and WWF. They are useful for efficiently estimating the numbers of certain wildlife species in very large areas (usually greater than 1,000 km^2) such as state protected areas, communal lands and private ranches. The surveys are flown during the dry season when animals can be seen more easily because there are no leaves on the trees. Aerial surveys are reliable only for large dark-bodied animals such as elephant, buffalo and sable. It is impossible to get meaningful estimates for smaller antelope species or for predators because:

- they are too small to be seen, or
- they are camouflaged or nocturnal and so cannot be seen easily.

How is an aerial survey carried out ?

This will depend on the terrain in the wildlife area. In large, flatter areas the aircraft flies along straight transects. These are strips usually 150m wide on either side of the aircraft and from 2 - 5 kilometers apart. The aircraft flies at a height of 100m above ground level. There is normally an observer looking out of each left and right rear window at a predetermined strip in which they count all the animals.

The sample area in which all the animals are seen and counted and the total survey area or census unit are known. Using these figures the estimate of the total population size can be calculated. Surveys are always designed to bisect the major rivers and so avoid possible bias.

What are the advantages and disadvantages of using an aerial survey?

The advantages of using an aerial survey and aircraft are that:

- it is possible to quickly and efficiently sample and estimate the wildlife populations for extremely large wildlife areas,
- it does not depend on ground access to the wildlife area.

The disadvantages of using an aerial survey and aircraft are that:

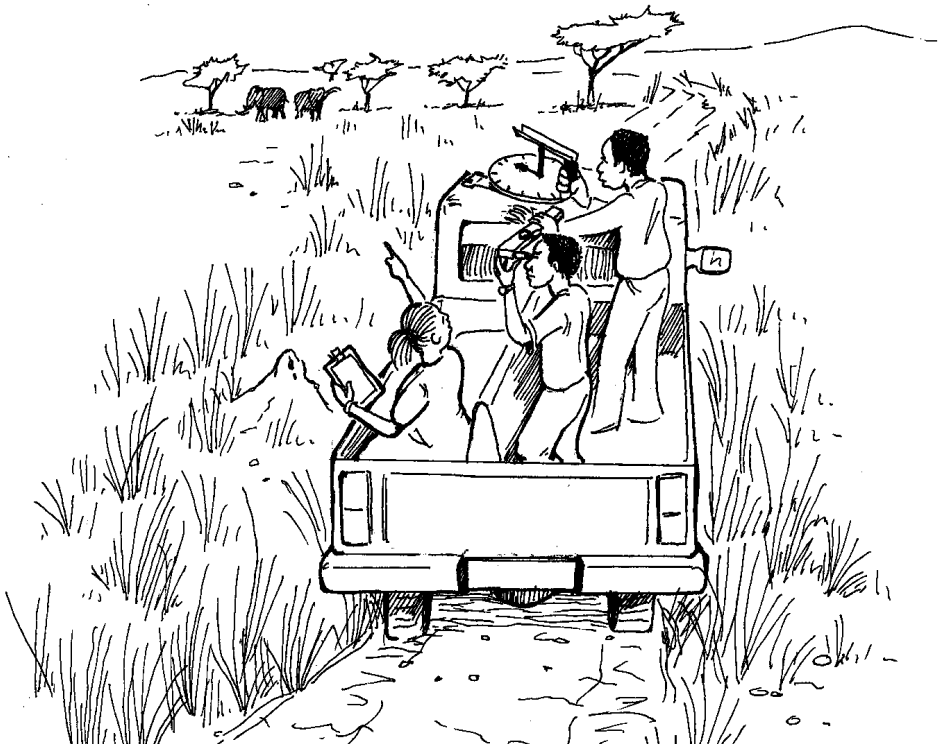
- it is expensive and requires skilled personnel such as a pilot, biologist and observers,
- it is of no use for small animals or predators.

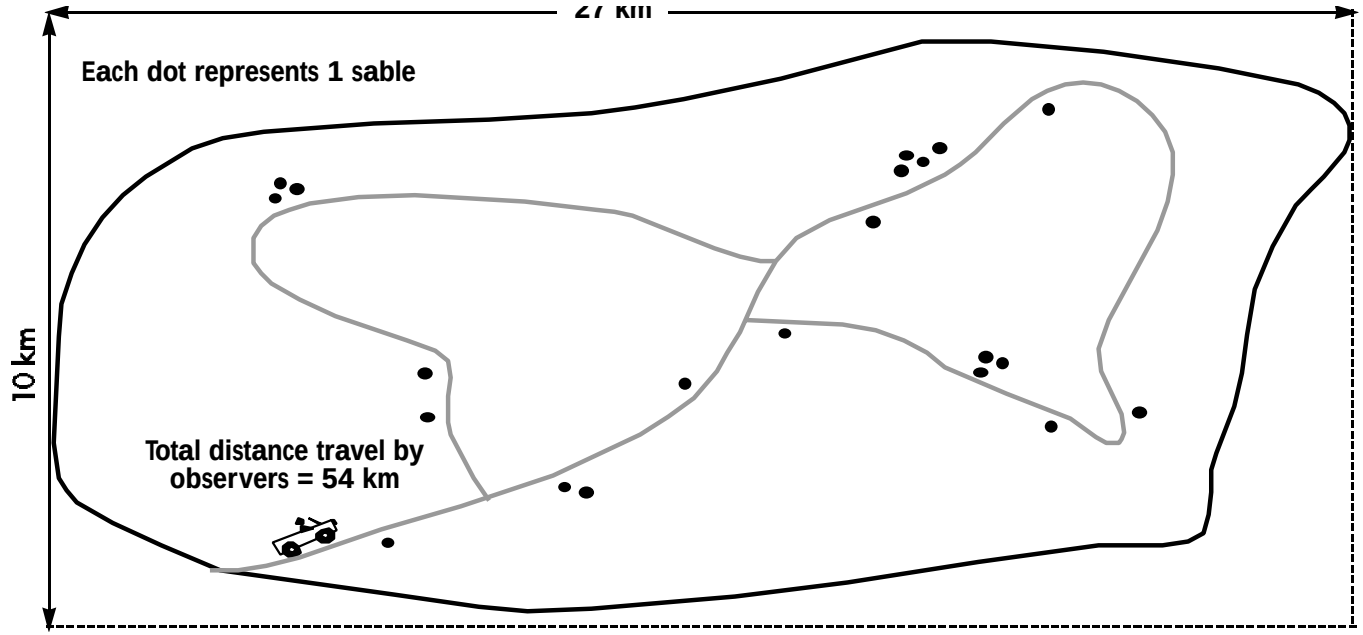
Where and when are road strip counts used?

A road strip count is the most common way of ground-based sampling. Road strip counts are usually used in smaller wildlife areas (100 - 1000 km^2) and game ranches such as Buffalo Range and the Save Conservancy in the south-eastern Lowveld.

How is a road strip count carried out?

In a road strip count a vehicle is driven along a selected network of roads in the wildlife area under survey. Observers in the back of the vehicle count all the animals seen and measure their perpendicular distance from the road with a range finder and an angleometer.
The sample area is calculated from the average distance that animals are seen from the vehicle and the total distance travelled. If the size of the area is known then the total population of wild animals in the area can be estimated.





An example of a road strip count

The total wildlife area = 270 km^2

Distance traveled by observers = 54 km

Average distance of animals seen from the road = 0.5 km

Total area surveyed = 54 km x 0.5 km = 27 km^2

Total number of sable seen = 21

Therefore in 1 km^2 there are 21/27 sable

Therefore in 270 km^2 it is estimated that there are:

21/27 x 270 = 210 sable

The estimated total sable population is 210

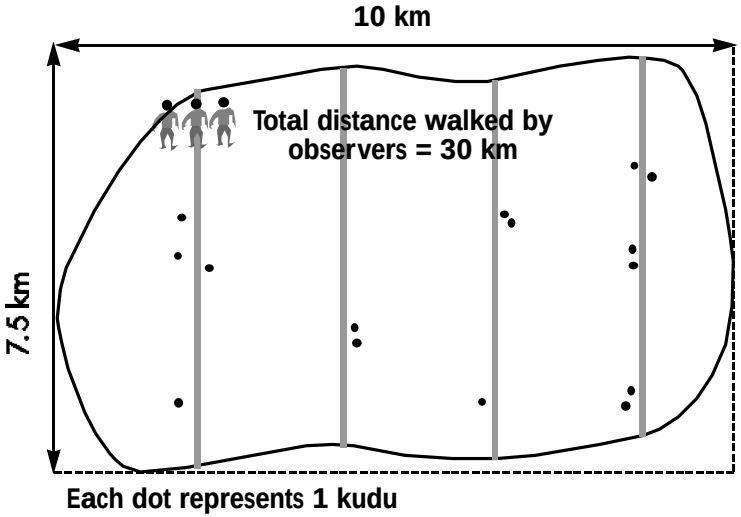
What are the advantages and disadvantages of road strip counts?

The advantages of using road strip counts from a vehicle are that:

- they provide estimates for more species than an aerial survey because most species larger than a duiker will be seen.

The disadvantages of using a vehicle are that:

- a well established road system is needed,
- a road system that is not biased towards certain habitats is needed.
- an accurate measurement of the distance of each sighting from the road is needed,
- a vehicle is needed making it relatively expensive,
- the analysis can be quite complex.



An example of a walked transect

The total wildlife area = 75 km^2

Distance traveled by observers = 30 km

Average visibility from transect = 0.25 km (125 m either side)

Total area surveyed = 30 km x 0.25 km = 7.5 km^2

Total number of kudu seen = 15

Therefore in 1 km^2 there are 15/7.5 kudu

Therefore in 75 km^2 it is estimated that there are

15/7.5 x 75 = 150 kudu

The estimated total kudu population was 150.

Where and when are walked transects used?

Walked transects are used mostly on small wildlife areas (100 - 500 km^2) like game ranches or where there is a strong level of community management for example in a communal land wildlife area.

How is a walked transect carried out?

In a walked transect, the observer or observers walk along transects counting the animals seen on either side of the transect.

As with a road strip count it is important to measure the distance of the animals from the transect and the length of the transect if an estimate of the population is to be calculated. Transects can be counted several times in a year, but if limited to once only, then the count is best carried out during the dry season.

What are the advantages and disadvantages of a walked transect?

The advantages of a walked transect are that:

- observers walking on foot through a wildlife area will probably see a greater range of species than any of the other methods,
- it is a relatively cheap method of estimating wildlife populations.
- it allows a high level of community participation.

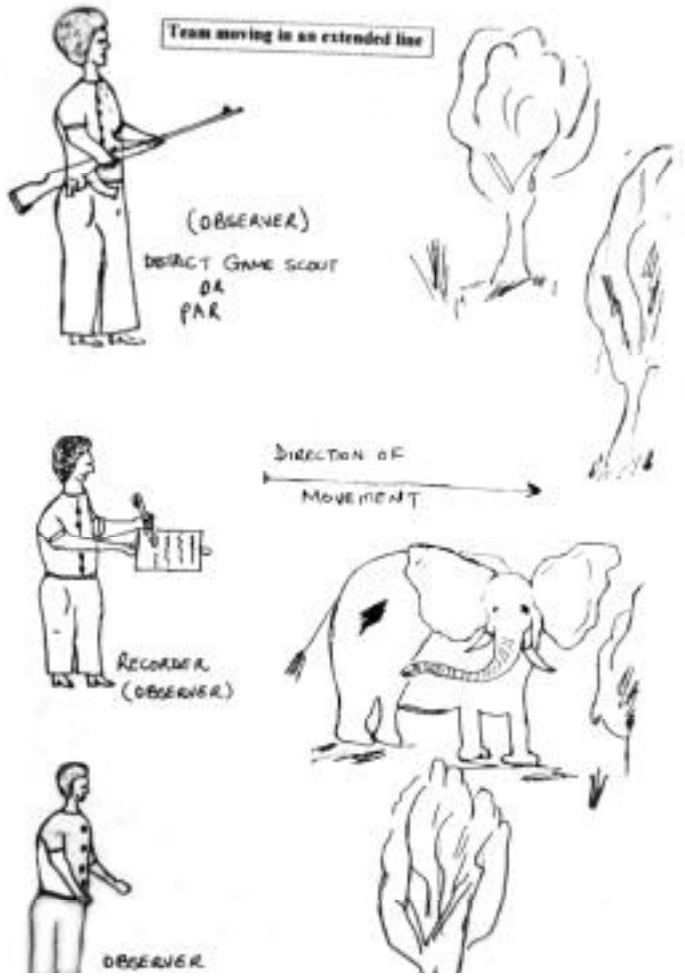
Total, sample and index counts compared			
	Total counts	**Sample counts**	**Index counts**
Method	All the animals in a defined area are counted, usually from an aircraft.	All the animals in a sample area transect or block, are counted.	An indicator of the status of the population is measured repeatedly over time.
Product	A minimum count of the number of animals present.	An estimate of the number of animals present.	Information which will give a trend over time.
Main advantages	Gives the wildlife manager a minimum figure to use.	Gives the wildlife manager useful estimates for key species.	Collection of information can be integrated into everyday activities.
Main disadvantages	Very expensive and no measure of error possible.	Suitable for the range of larger mammals.	Needs to be collected using the same method repeatedly.
Applicability	Small fenced wildlife areas only. eg. A farm or sanctuary.	Large to very large wildlife areas. eg. National Parks and Communal Lands.	All wildlife management areas eg. Farm, sanctuary, National Parks and Communal Lands.

The disadvantages of a walked transect are that:

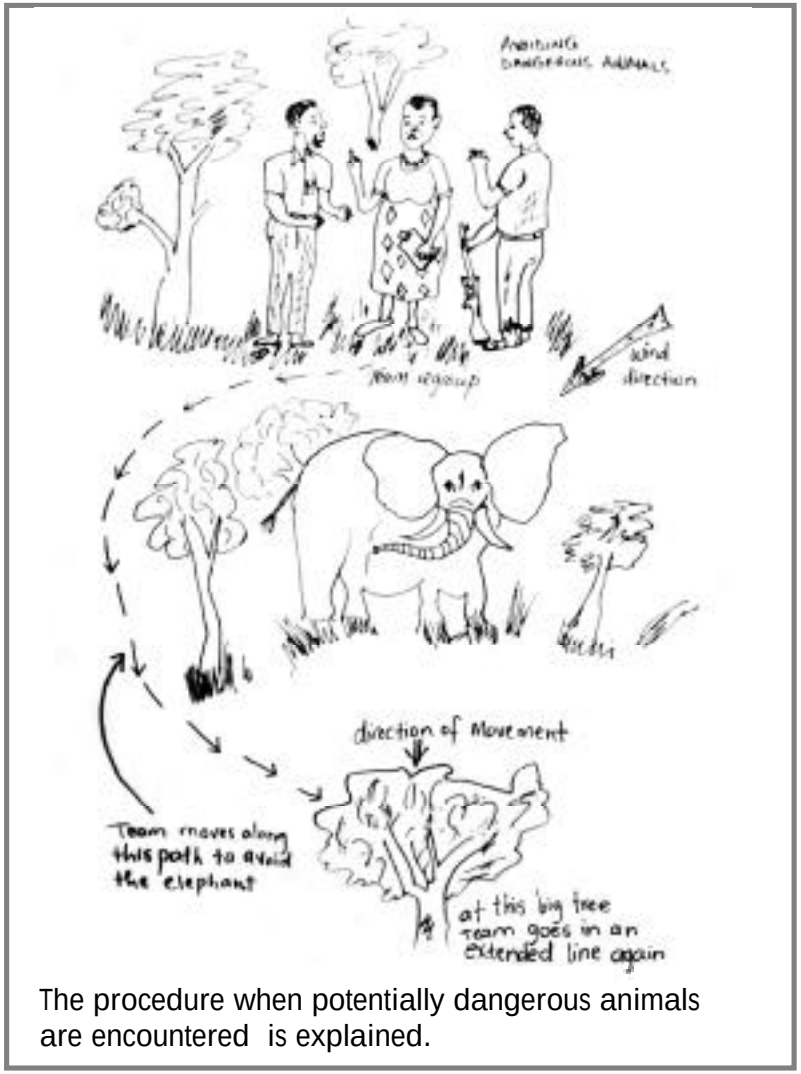
- unless a large number of transects and people are used, the sample area, as a proportion of the total area, will be very small,
- observers can come into close contact with wildlife, which is potentially dangerous,
- to provide reliable estimates, the length of the transect and the distance of each sighting from the transect needs to be measured.

Despite these disadvantages, sample surveys conducted on foot are an appropriate method for use by communities who need to estimate wildlife populations for management purposes.

Procedures for a walked transect.



The procedures for moving along the transect and recording of wildlife is explained.



The procedure when potentially dangerous animals are encountered is explained.

CHAPTER 3

TECHNICAL, SOCIAL AND FINANCIAL FACTORS AFFECTING THE CHOICE OF SURVEY METHOD

What factors affect how a survey is carried out ?

The method chosen, and the way in which a count is done will be determined by technical, social and financial factors of the area as well as the objective of the count.

What technical factors need to be considered?

Selecting a method for estimating wildlife numbers depends on what you need the information for. Since most CAMPFIRE areas currently manage their wildlife for sustainable trophy hunting, the main objective has usually been to get sufficient information for setting a sustainable hunting quota. The factors which will influence the method you choose include:

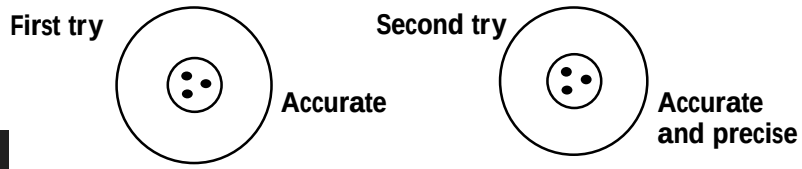
- the skills available in the community or RDC to design the survey, collect and analyse the information,
- the resources available for the count, such as people to walk transects and analyse data, four wheel drive vehicles, or access to a light aircraft,
- the size of the area; whether it is a small game park (less than 100 km^2), a ward (say 1,000 km^2), or a very large area including national parks estate and adjacent communal lands (say 15,000 km^2),
- the type of vegetation or habitat; a count in an open grassland will be done differently to one in woodland, thick bush or forest,
- the nature of the country; whether it is flat and accessible or mountainous and inaccessible,
- the road network; whether there are enough roads,
- the species of animals that need to be counted; for example counting large mobile animals such as elephant and buffalo will be done in a different way to small resident animals such as bushbuck and duiker.

Whatever method you choose, it should give accurate and precise estimates of the wildlife population.

Why does counting have to be both accurate and precise?

All counts ideally should be both accurate and precise. Accurate means how close the number of animals counted or estimated is to the actual or true total number of animals. Precise means how close successive counts of animals are to each other.

Imagine marksmen shooting at a target. They manage to get many shots in the bulls-eye area. This is called accurate shooting. If, the next time they decide to practice, they also get most of their shots in the same bulls-eye area, then their shooting is also precise. (See Appendix 2)



This is similar for a biologist or a community counting wildlife. A technically acceptable method is one which gives an accurate estimate of the wildlife numbers as close to the actual or true numbers as possible, with the same level of precision every time they are counted.

The difference is that when you shoot at a target the bulls-eye is clearly seen by everyone, but because of the nature of wildlife, the actual numbers of wild animals is unlikely ever to be known.

How can the accuracy of the chosen method be checked?

This is very difficult, although we know from experience and cross-checking that aerial surveys can be accurate when they are used to count large dark-bodied animals in the dry season. Population estimates and trends should always be compared with other sources of information such as the results of indirect methods (ie trophy quality, hunting effort and quota utilisation).

How can the precision of the chosen method be checked?

If the chosen method can be repeated exactly, then it is likely that it will give precise results. To make a method repeatable, it should be as simple as possible. It should also be carefully documented so it can be followed and repeated exactly as previously.

What social and financial factors need to be considered?

In CAMPFIRE and similar CBNRM programmes, the key participants in counting wildlife are those people who live with, manage and benefit from wildlife. The role of other stakeholders such as government departments (DNPWLM), RDCs and outside agencies (CAMPFIRE Association, Zimbabwe Trust and WWF) should be to assist producer communities in this exercise.

If a community is to develop and manage the wildlife count, it needs to consider the social and financial factors which will affect its ability to sustain a counting method. These include:

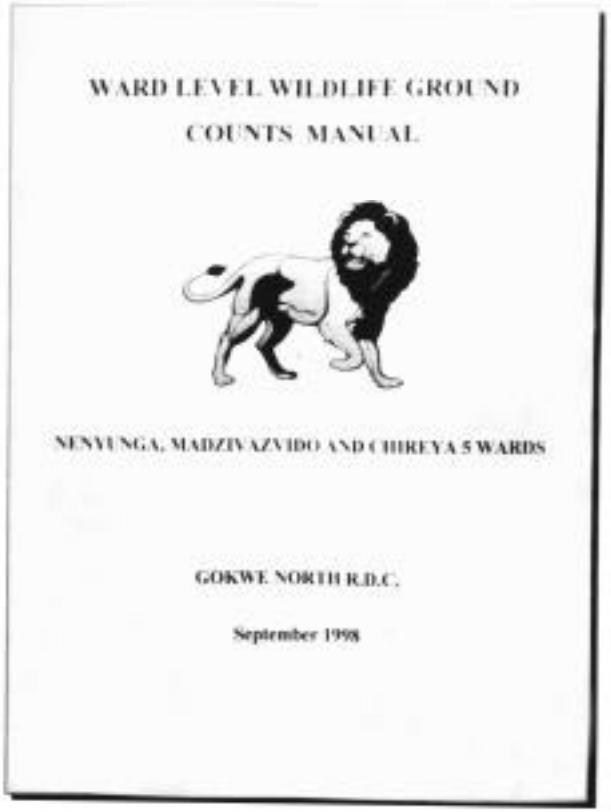
- the participants' formal (school & college) and informal (bushcraft & local technical knowledge) skills. In most communities it is possible to find people with sufficient formal education capable of carrying out simple index and sample based counting. More importantly, there are often high levels of informal skills and knowledge about animal numbers, their behaviour and their distribution. These skills must be recognised and used in the chosen method.

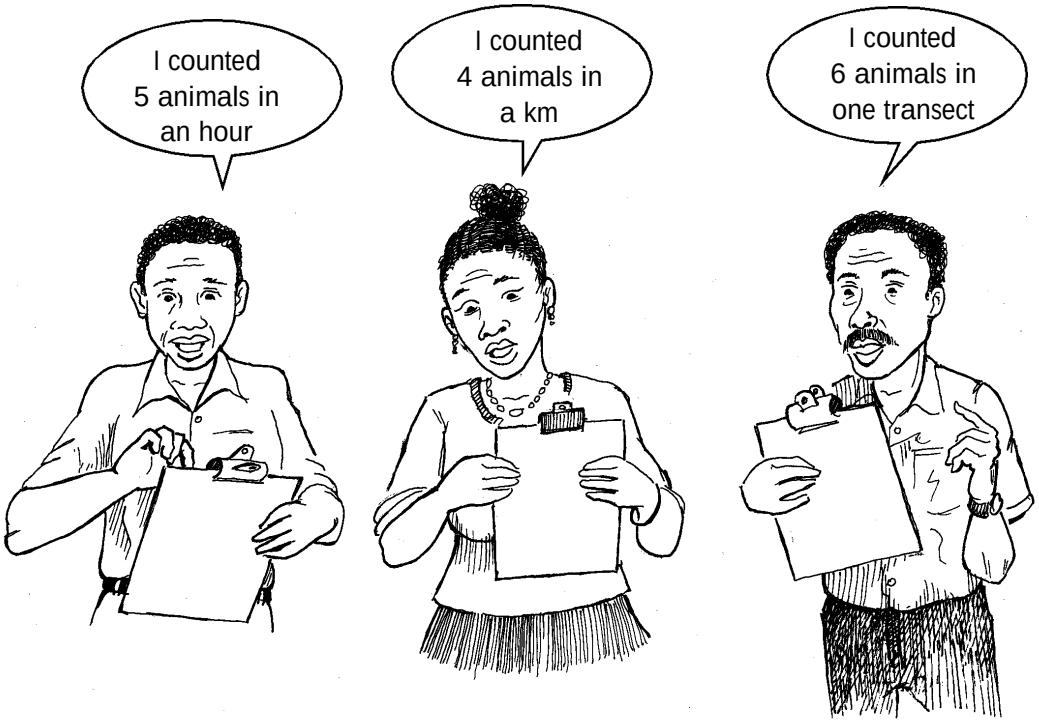
- the participants' time in implementing the counting method. People's attitude to the counting method will usually depend on how much of their time is needed, whether it is voluntary or paid work and how much risk is involved. The chosen method should:
    - not take up too much time,
    - be scheduled at a time of the month or year when the community is not busy with farming activities,
    - be physically 'easy' and risk free. Methods which involve people in a high level of physical discomfort and or risk will be quickly modified or rejected.
- be cost effective. Counting wildlife always involves costs. It is important to clarify who is paying for the counting. It must be agreed whether the survey is a 'ward' or 'district' activity and who is meeting the expenses. If there is an initial external funder, it must be established how the survey will be continued in the long-term. If the chosen counting method is too expensive compared with the revenue earned from the wildlife, it will not be sustainable. This decision must be made locally but the cost should not exceed 5-10% of the total income.

Why is community participation essential?

The development of any counting method must involve those people living with wildlife. They should be involved at the start when the need to count animals is identified, right through to the implementation of the chosen method. Only in this way will the process be seen as a means to an end (the maintenance or improvement of high quality trophy hunting) and will have been developed and agreed with the participants, rather than imposed.

Since survey methods should be 'tailored' to district needs, every district should develop its own manual for recording local details.





In order to compare counts between different areas and at different times, it is necessary to relate our counts to some fixed unit of measurement. This provides us with our baseline measure, which is normally animals per unit area.

CHAPTER 4

IMPLEMENTING GROUND-BASED INDEX COUNTS

What points should be considered when organising a ground-based count?

Participatory counts must be simple, straightforward and inexpensive, if they are to be sustainable. In encouraging community participation, the organisers should be aware that:

- unnecessary equipment should not carried by observers who need to concentrate on observing and counting,
- the chosen survey method should be organised so that people can get to and from their transects on foot. If vehicles are needed, this will greatly increase the cost. If pre-defined transects are being used these should not be too long and should be well known and use clear land marks.
- to give trends of wildlife estimates, surveys need to be undertaken regularly, for example annually. This also means that the community comes to accept them as a part of the annual cycle of work.
- the survey method should be simple. This means that initially an index of numbers per unit distance and / or time can be used.
- the survey method should be recorded clearly so that the survey can be repeated even if the original participants are no longer available. Locally written manuals are a good way of recording the survey methods used.

Why is a 'baseline' measurement needed?

In order to compare counts between different areas and at different times, it is necessary to relate our counts to some fixed unit of measurement. This provides us with our baseline measure, which is normally animals per unit area.

If the survey aims to provide an index, then our baseline can be:

- time,
- distance,
- transect or the wildlife area itself.

(see illustration opposite)

Method One: How can daily patrols be used to collect information on wildlife numbers?

Many districts and wards have game guards or resource monitors who are already working in a wildlife area on a daily basis. A simple index can be developed which is based on their 'encounters with wildlife'. The information must be collected in a consistent and repeatable manner so that it can be compared over several years. The best way to do this is for game guards to record the number, species and location of animals seen per unit of effective patrol time.

Method Two: How can fixed transects be used by game guards to collect information on wildlife numbers?

Game guards or resource monitors can also identify transects with the specific aim of counting wildlife. They must decide:

- how often they use the transects, for example, monthly, quarterly or annually.
- how to collect the information from the transects in a consistent and repeatable manner. Again, the best way to do this is for game guards to record the number, species and location of animals seen per unit of time.
- how to store and analyse the information from the counts so that it is readily available and can be used for management decisions like setting quotas.

What is the "effective patrol time?"

With both methods it is very important to record when patrols actually start and finish. There is always some time spent getting to the wildlife area to be patrolled or time spent doing other things while on the patrol, so the amount of time actually spent on wildlife sightings or detecting illegal activities must be recorded as the "effective" patrol time. This is obviously important if time is being used as the index of abundance. This approach has been successfully applied in Kanyurira Ward where wildlife sightings are recorded together with information such as the incidence of illegal activities. A typical wildlife reporting form which captures all this information is provided on page 28.

Method Three: How can fixed transects be used by community members to collect information on wildlife numbers?

Members of the wildlife producer community can take part in surveys based on fixed transects. The advantage of this approach is that by using volunteers from the community, a large area can be covered each day. This will avoid the problems of double counting.

The simple rule for this method is that the more transects that are used in the survey, the better the results will be. However the number of transects will depend largely on the number of people available as observers, the budget and the time available for the survey.

Fixed transects should follow a straight line and should be selected using local knowledge and technical advice. They should not follow paths which members of the community regularly walk along, since wild animals will keep clear of these.

Experience shows that transects should not be more than 8 to 10 km in length. This will allow the participants to walk to the transect, walk along the transect and then walk home. The transects need to be carefully sited and long enough to sample the different habitats and the different species which occur in the area.

Frequency	Time of survey	Advantage	Disadvantage
Monthly	Every month	Gives a better picture of wildlife for the whole year	More expensive and needs more people. Data needs careful analysis
Seasonally	Hot and wet season (Jan/Feb) Cool and dry season (May/June) Hot and dry season (Sept/Oct)	Gives seasonal changes of wildlife numbers	Access is often difficult during the wet season. Farmers are also busy with crops
Annually		A cost effective method for community purposes	Gives an index for that time period only

It is a good idea to start with only one or two transects and build the number up gradually as experience is gained and the availability of resources (manpower and time) can be assessed. It will probably require at least one full day per transect using at least two persons per transect.

The frequency of the count will depend on the financial and human resources and on what information is required. They can be done by month, season or annually. In Gokwe North this method is used once a year. There are advantages and disadvantages for each frequency. (see table above)

What information needs to be recorded on the fixed transects?

On a fixed transect, the participants (game guards or volunteers) need to record the following:

- the total distance travelled along the transect. Knowing the distance travelled allows an index of animals observed per unit of distance to be calculated.
- the animals and species to be counted. Observers must be clear which species they are counting (all) and when they count them. With ground-based index counts, participants generally count all the animals that they see.
- the time taken to walk along the transect. This will allow an index of animals (by species) per unit of time to be calculated.
- the location of the sighting. The ideal practice is to note the place and also the time of each observation. This will allow the location of animals seen to be calculated. This information can be used to analyse the distribution of animals seen.

A simple standard form such as the one shown on page 28 taken from the Kanyurira Wildlife Manual, can be used .

A sample of a form used for counting wildlife in Kanyurira

Transect number / Name:									
From:	To:								
Start time:	End time:								
Observers:									
Time	Species	Numbers						Area name	Grid reference	Habitat
		Adult		Sub-Ad		Juvenile				
		M	F	M	F	M	F			

The summary of data from an index count in Block 1, Chilazi Wildlife Area							
	Transect 1	**Transect 2**	**Transect 3**	**Transect 4**	**Transect 5**	**Total sightings (S)**	**Total seen (No.)**
Elephant	2,4	1	0	0	5,4	5	16
Buffalo	0	21,1,1	2	4	3,4	7	36
Sable	3	1,3	0	0	1	4	8
Zebra	0	2	1	11	8	4	22
Impala	23,5,11	0	0	0	15,3	5	57
Distance (km)	5.5	7.5	6	8	3		30
Effective time (hrs)	3.25	4	3	4.25	2		16.5

What equipment is needed to help analyse game counts?

Pencil and paper are all you need when making a start on analysing data which has been collected. Clipboards carried during transect counts are very useful for writing data onto the record sheets. A calculator may be all that is needed to add up totals, work out averages and to do multiplication and division where necessary.

What should be done with the results?

Completing the count on the ground is just the first part of the exercise. It is important that observations are also properly stored and filed. For safety, the files should be kept in one place such as a filing cabinet or office shelf.

Completing just one transect or one survey will not tell us very much about wildlife numbers in an area. However it provides the first set or baseline data. To compile a useful set of information, the counts need to be done regularly over a number of years. Only then can trends be detected and appropriate planning and management decisions made.

How should the data be analysed ?

For data to be useful, it must be analysed immediately and compared with other results. Data can be analysed using simple arithmetic. As skills develop more complicated methods of analysis can be used.

The main steps are shown in the example below.

Step One:

Using the recording sheets add up and summarise:

- the total number of animals seen by transect
- the total number of sightings which were made by transect.

This will give a summary for each block, as shown in the table above.

The summary results of the 1999 index count in Chilazi Wildlife Area										
Species	Block 1		Block2		Block3		Block4		Total sightings (S)	Total seen (No.)
	S	No.	S	No.	S	No.	S	No.		
Elephant	5	16	1	3	6	19	8	26	20	64
Buffalo	7	36	4	15	12	63	5	30	28	144
Sable	4	8	2	2	5	9	5	7	16	26
Zebra	4	22	1	2	7	35	4	29	16	88
Impala	5	57	3	15	4	67	12	89	24	228
Total distance	30		28		33		29			120
Total hours	16.5		15		16		14.5			62

Step Two:
Using the block summary sheets add up and summarise:

- the total number of animals seen by each block
- the total number of sightings which were made in each block
- the total effective distance and time spent in the blocks

This will give a summary for the whole wildlife area, as shown in the table above.

Step Three:
Using the annual results add up and calculate:

- total sightings by species
- total number of animals seen by species
- the total distance walked and the total effective hours
- an index of the animals seen per kilometre and the animals seen per hour

This will give indices of abundance, as shown on page 31.

The indices of abundance calculated for five species for the Chilazi Wildlife Area (1999)						
Species	**Total sightings**	**Total seen**	**Total distance (km)**	**Animals per km**	**Total hours (hrs)**	**Animals per hour**
Elephant	20	64	120	0.53	62	1.03
Buffalo	28	144	120	1.2	62	2.32
Sable	16	26	120	0.22	62	0.42
Zebra	16	88	120	0.73	62	1.42
Impala	20	228	120	1.9	62	3.68

Step Four:
Using this year's and previous years indices:

- compile a summary of the results over several years

This will give a time series of the results, as shown in the table below and the selected graphs over the page.

How can these results be used?
For most wildlife producer communities, the objective of counting wildlife is to ensure that hunting quotas are sustainable. The quota setting methodology relies on comparing several sources of data such as the results from ground counts and aerial surveys, trophy quality, hunting effort and quota utilisation (see the Quota Setting and Managing Safari Hunting Manuals). Using all these sources of information will give you an overall picture of what is happening to the animal population in the wildlife area.

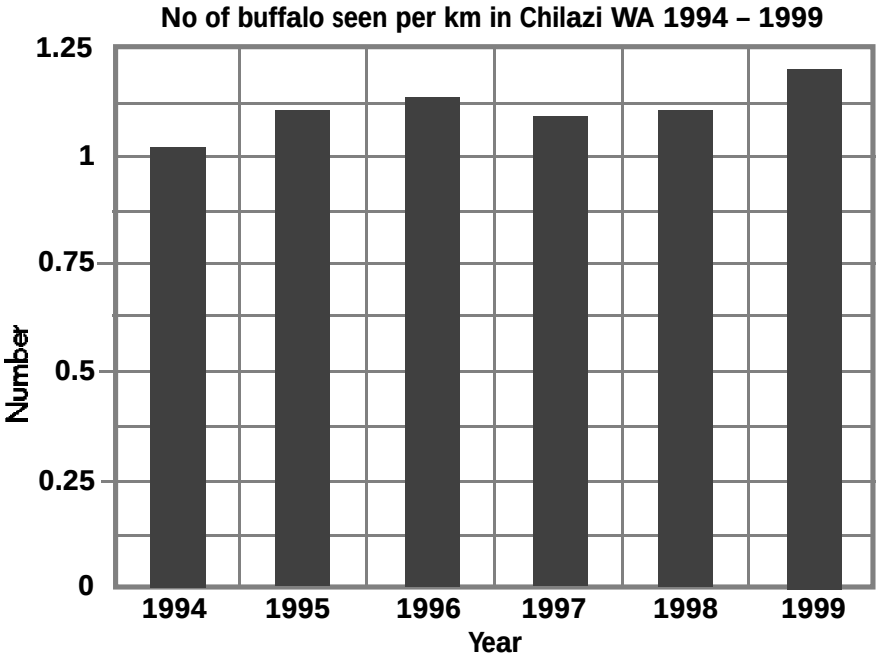
The results of wildlife counts and associated information are also very important for:

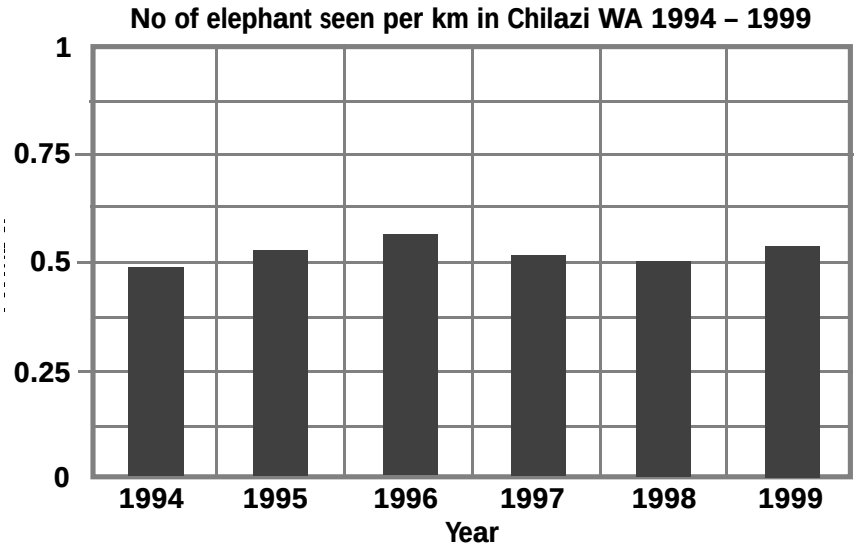
- developing appropriate land use plans and problem animal management strategies
- helping safari operators plan their hunting

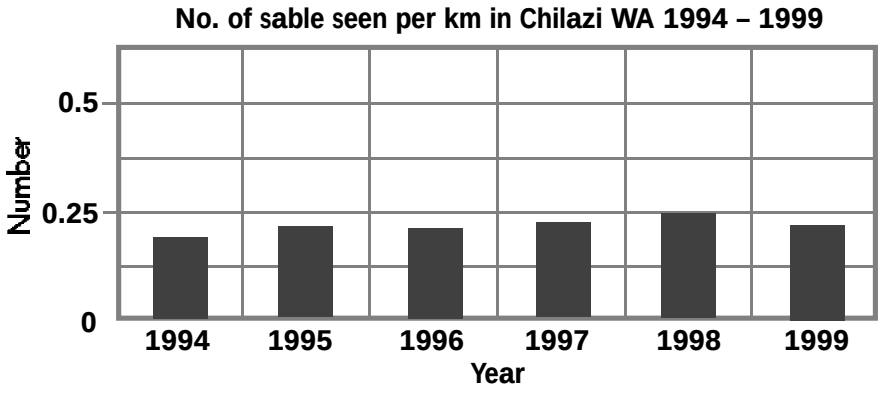
A summary of animals seen per kilometer between 1994 and 1999 in the Chilazi Wildlife Area						
Species	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Elephant	0.49	0.52	0.55	0.51	0.50	0.53
Buffalo	1.03	1.11	1.14	1.09	1.11	1.20
Sable	0.19	0.22	0.22	0.23	0.25	0.22
Zebra	0.75	0.65	0.59	0.62	0.66	0.73
Impala	2.0	1.95	1.85	1.75	1.71	1.9

The results of wildlife counts should be seen by a wide range of people. One way of doing this is to produce information posters for display at key places such as shops, schools, clinics and meeting places.

Can an index count be developed into a sample count?
This is possible if sample areas can be calculated, and can provide a more reliable estimate of animal numbers. However it requires considerable investment in equipment (range finders and compasses) as well as appropriate training.







CHAPTER 5

CASE STUDY IN COUNTING WILDLIFE

This chapter outlines the Annual Ground Count of the Wildlife Corridor in North Gokwe.

How Gokwe North carries out its annual ground count

In North Gokwe, wildlife counting is carried out annually using members of the community to walk along transects. It uses the 'index method' because there is no attempt to calculate area and estimate a population. To improve precision, the count is always done either in the last week of June or the first week of July. The count is carried out during the first four days of the week while on Friday a quota setting workshop is held.

Scene 1: Planning and preparation

Before wildlife are counted the Campfire Co-ordinator considers

- when will the count be done?
- who and how many people will be involved?
- how will wildlife counters get to the wildlife corridor and the transects?
- what other resources will be needed?

Scene 2: The transect counting process

After arriving at the counting area, everyone is briefed about:

- why the count is being done.
- what method is being used.
- what animals are to be counted.
- how the information will be recorded.
- what safety precautions should be taken.

Scene 3: The wildlife area and position of transects

The wildlife area in Gokwe North is divided by the Campfire Co-ordinator into five blocks. Each block has transects marked. Blocks 1, 3, 4 and 5 have six transects each. Block 2 has four transects. Transect lengths are measured using 1:50 000 maps and are permanently recorded and known.

Scene 4: Dividing the groups

Participants are divided into groups of at least three, with the leader having a rifle. Up to six transects are covered each day, with as many as 40 or more people taking part. Each group has a pen, a watch, a transect counting form and a clipboard. If the participants are not familiar with the area a compass is also given.

Scene 5: Allocation of transects

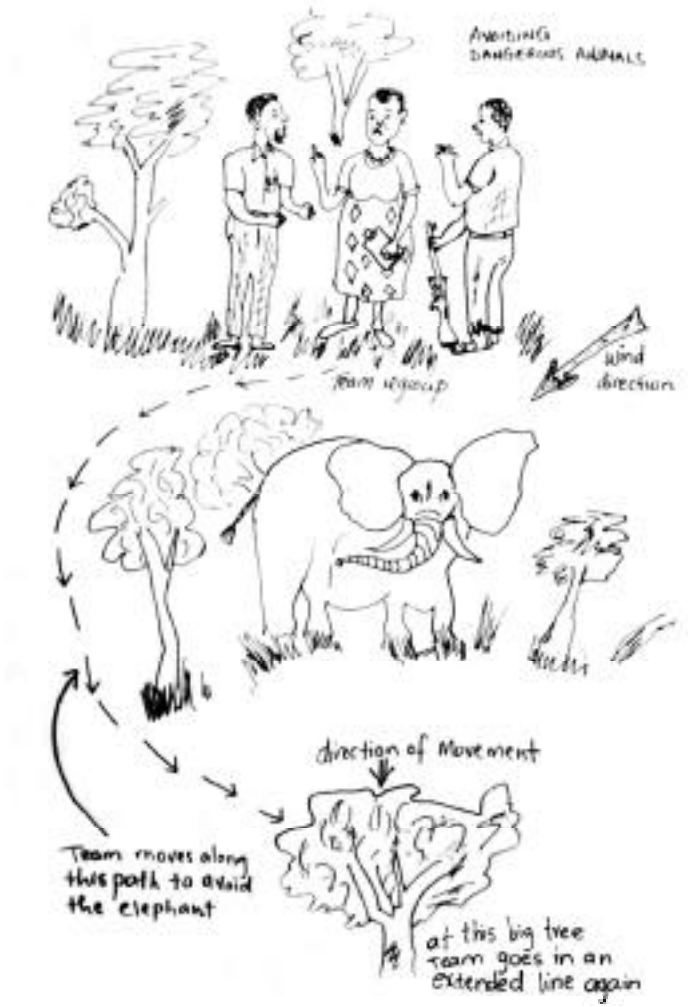
Using the map, each group is shown the start and end points of their transects and then go to their transects either by vehicle or foot. The participants must agree on how they will communicate with each other before they start their transect.

Scene 6: Moving off

As the team starts moving, the recorder notes the starting time. The other two members maintain a straight line with the centre member who acts as recorder. The team maintains transect direction by using natural land marks in front of them.

Scene 7: Searching for animals and recording observations

All members of the team search continuously for animals in an arc of 180 degrees to the left, front and right as far as they can see. On making an observation, the team stops, records what has been seen (animal species and number) and the time, before continuing to walk.



Scene 8: Avoiding danger

During the count participants may come across dangerous animals such as lions, elephants or buffaloes. If these animals are in the transect, the team members regroup and discuss ways of bypassing them, but ensuring that they are all counted. Wind direction is an important consideration. At the same time the team members observe a land mark in front of them within the transect which they use to maintain the direction once the animals have been bypassed.

Scene 9: At the end of the transect

When the team gets to the end of the transect, the time is recorded on the transect counting form and counting stops. Animals seen when moving between transects or on the way to the pick-up point are not recorded.

Scene 10: De-briefing

Following the count, each team hands over their data sheets to the Wildlife Co-ordinator who checks them to ensure they have been completed properly. Date, block and transect numbers, transect lengths, start and end times, species and time observed and number and names of observers are all items of information that require checking.

Scene 11: Recording results on a transect analysis sheet

The Wildlife Co-ordinator explains how the results from the transect counting forms will be compiled and analysed. Participants are divided into five groups. Each group is asked to draw up a transect analysis table on the back of the data sheets. They do this by asking each of the original team of three members to record the observations and total numbers of animals seen in their transect, on the transect analysis sheet for each block.

Scene 12: Summarising results for all blocks

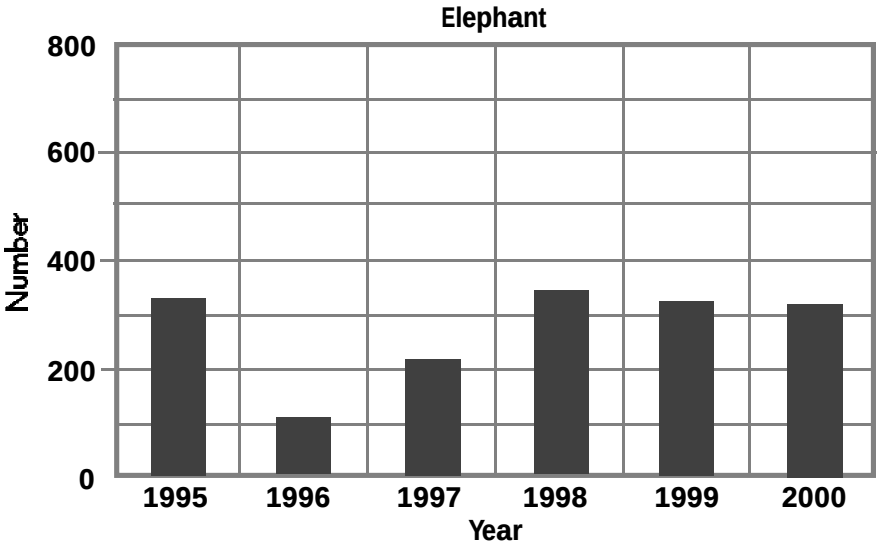
The total number of observations and numbers for each species for all the transects are then added up and the totals for each block are transferred to the Area Analysis Sheet which summarises the results for all blocks. The total number of observations and animals for the area is found by adding all the observations and numbers for the five blocks.

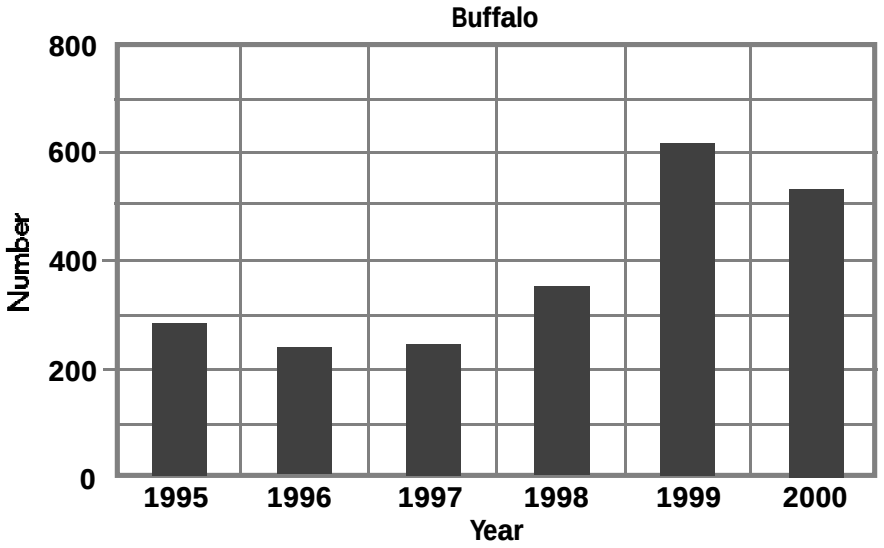
Block summary from North Gokwe

Species	Block 1		Block 2		Block 3		Block 4		Block 5		Totals	
	S	No.	S	No.	S	No.	S	No.	S	No	S	No.
Elephant	9	64	6	67	12	17	9	115	10	59	46	322
Buffalo	1	33	4	60	7	102	7	121	10	151	29	523
Impala	2	16	1	17	5	67	4	81	2	35	14	216
Kudu	4	15	5	17	6	34	3	12	6	26	24	104

KEY: **S** = Number of Observations (This is the number of times a species is seen e.g. 9 sightings of elephant).
No. = Number (This is the total number of animals observed e.g. 64 elephants).

Summary of ground counting results for North Gokwe 1995-2000												
Species	**1995**		**1996**		**1997**		**1998**		**1999**		**2000**	
	S	**No**	**S**	**No.**	**S**	**No.**	**S**	**No.**	**S**	**No.**	**S**	**No.**
Elephant	27	332	19	116	61	224	43	356	36	330	46	322
Buffalo	16	290	10	233	13	248	28	360	18	612	29	523
Impala	27	626	18	264	19	409	20	410	19	442	14	216
Kudu	19	98	16	83	25	71	31	136	29	120	24	104

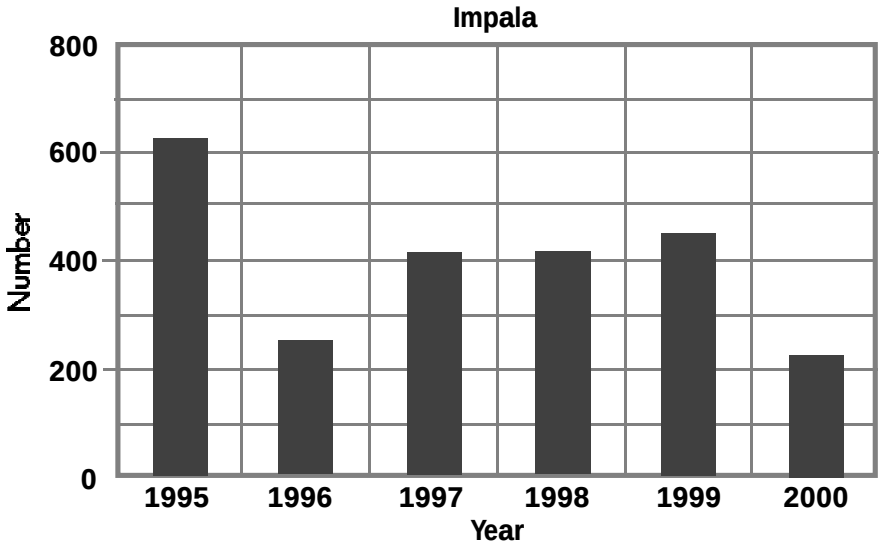


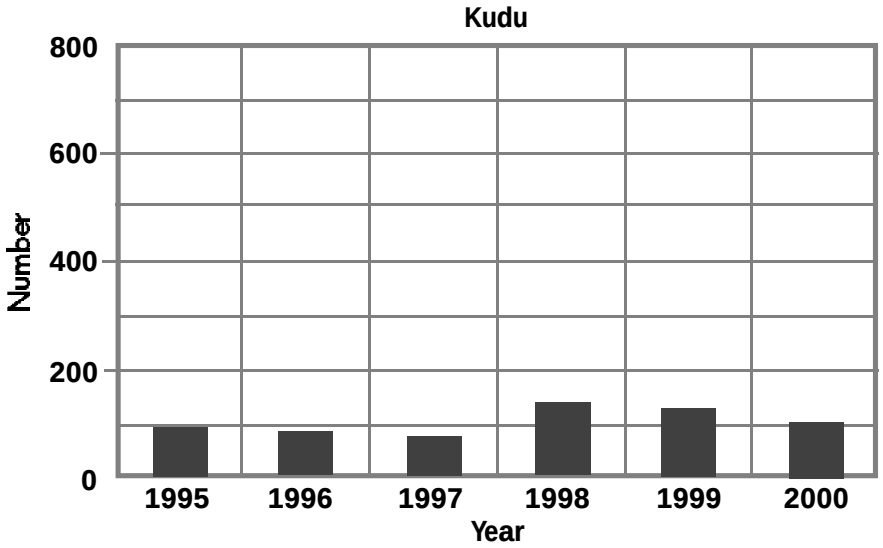


Scene 13: How to use the results

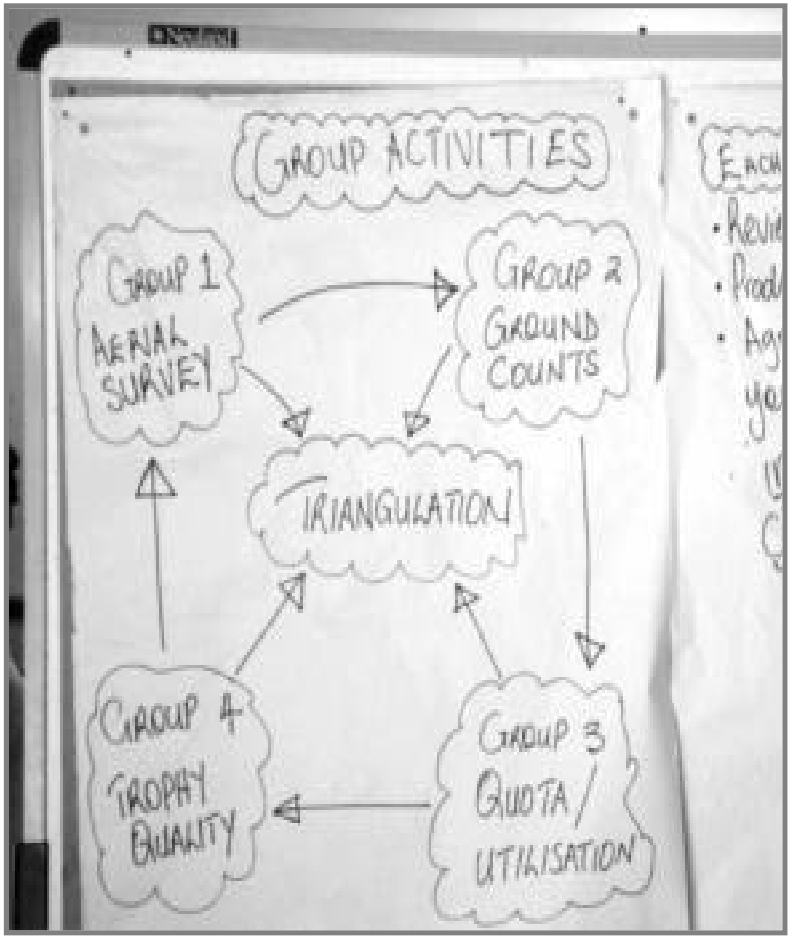
Results for one year alone cannot tell us whether the numbers of animals are increasing, decreasing or staying the same. However, looking at the results for one year we can tell the numbers counted, where they have been counted, which areas have more animals or which type of animals has the largest number or the smallest number within the area.

Therefore in order to know if the number of animals is growing we need to compare the current set of count results i.e. this year, with those of the previous years. It is this information that provides trend information and which can be used in quota setting workshops. The table opposite and the graphs below show how the results can be compared.





After counting wildlife in an area, all stakeholders meet for the quota setting exercise.



APPENDIX 1

GLOSSARY

There are a number of key words and phrases associated with counting animals which the reader needs to be familiar with. These have all been indicated in **bold** within the text the first time they appear.

Summary of key words and phrases

Word / phrase	Meaning	Example
Survey or census	refers to the collection of information on animal numbers and distribution	The crocodile **survey / census** was carried out between midnight and 4 am every day for three days on the Sengwa River.
Aerial survey	refers to the collection of information on animal numbers and distribution using an aircraft	The Omay **aerial survey** was flown between 3rd and 21st of July 1998.
Total area	refers to the total area for which a count of wild animals is required	The **total area** of the wildlife corridor in Gokwe RDC is 360 km^2.
Sample area	refers to a defined area which is smaller than the total area for which an estimate of wildlife number is required	The **sample area** was 10% of the total wildlife area in Gokwe North RDC.
Transect	refers to a defined strip along or within which animals are counted (animals seen outside the transect are not counted)	Ten **transects** were counted in the sample area.

continued...

Summary of key words and phrases continued...

Word / phrase	Meaning	Example
Estimate	refers to the number of animals which have been calculated, usually from sample data	In 1997, the number of buffalo in the Dande Communal Lands was **estimated** to be 3,000 animals.
Population	refers to an estimate of all the animals in the total wildlife area	The total elephant **population** in the Gokwe Wildlife Corridor was **estimated** at 350.
Index	refers to an indirect measurement of the status of a wildlife population in the total wildlife area	i) The **index** of impala abundance in Kanyurira Ward in 1998 was 1.8 animals seen per hour. ii) The **index** of trophy quality for buffalo in Omay Communal Land in 1996 was the average horn length of 39 inches.
Trend	refers to the change over time in the numbers or index of a wildlife population in the total wildlife area	There was an increasing **trend** in elephant numbers between 1981 and 1996 from 8,797 to 13,257 in the Sebungwe region of Zimbabwe.
Angleometer	refers to the instrument or tool used to measure the angle of the animals seen, to the road	Five sable were seen, at an angle of 45° to the road.

APPENDIX 2

DEFINITIONS

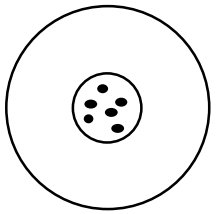
1. Accurate and precise:

When the marksman's shots are tightly grouped in or around the bulls eye, this is accurate and precise shooting. It is accurate because the shots are tightly grouped in the bulls-eye and precise because the shots are close together. If each shot represented a sample count of a wildlife population, then the results would be:

i. accurate because each shot is close to the actual number, as represented by the bullseye, and

ii. precise because each shot or count gives a similar result.

The ideal method of counting animals which is one which is both accurate and precise.



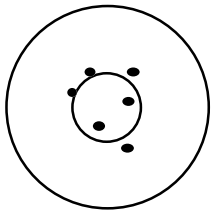
Accurate and precise

2. Accurate but not precise:

The markman's shots are scattered in and around the bulls-eye. This is moderately accurate but not precise shooting. If each shot represented a sample of a wildlife count, then the results would be:

i. moderately accurate because each shot is around or close to the actual number, and

ii. not precise because each shot is in a different part of the target.



Accurate but not precise

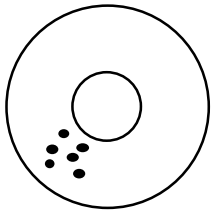
A method of counting animals which gives a result that is only moderately accurate but not precise would not be very useful because it would be very difficult to detect population trends.

3. Inaccurate but precise:

The marksman's shots are concentrated in the bottom left hand corner of the target. This is inaccurate shooting because the shots are off the bulls eye, but precise shooting because they are close together. If each shot represented a sample to count wildlife, then the results would be:

i. inaccurate because each shot is distant from the actual number, and

ii. precise because each shot or sample gives a similar result.



Inaccurate but precise

A method of counting animals which is inaccurate but precise would be acceptable as an index of the status of the population. If it was going to be used in quota setting it is important that it is triangulated with other sources of information.

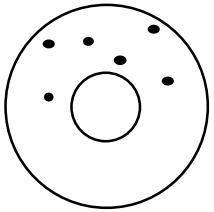
4. Inaccurate and not precise:

The marksman's shots are biased to one part of the target but are also widely scattered. It is biased because it is off the bulls-eye and not precise because it is widely scattered. If each shot represented a sample to count wildlife, then the results would be:

i. inaccurate because each shot is distant from the actual number, and

ii. not precise because each shot or sample gives a different result.

A method of counting wildlife which gives these kind of results is far from ideal and would not be acceptable.



Inaccurate and not precise

Transect Counting Form: Gokwe North Area #1. Block..... Transect.....

Species	Time	Numbers

Start time.....

End time.....

Date.....

Transect Length.....

Number of people.....

notes

This booklet is the seventh in a series of guides on wildlife management and examines in detail how wildlife may be counted. It provides background information and guidance to Rural District Councils and should be read along with the other booklets in this series. The WWF Wildlife Management Series provides information and guidance to members of villages, wards and rural district councils 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 Leases
4. Managing Safari Hunting
5. Quota Setting Manual
District Quota Setting Toolbox
6 Maintaining Electric Fences
7. Counting Wildlife Manual

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