Handout 1

ADAPTIVE MANAGEMENT

BACKGROUND DOCUMENT

INTRODUCTION

People living in rural communities in Namibia have increasingly decided to register as conservancies. By doing this they are given the right to benefit from wildlife utilization while accepting the responsibility for management of wildlife populations and sustainable utilization.

Like wildlife managers anywhere, conservancies have adopted the principles of adaptive management in order to be able to manage the wildlife in their areas effectively and efficiently in order to obtain maximum benefits for the community without damaging the populations on which they depend.

WHAT IS ADAPTIVE MANAGEMENT

There are two approaches to management planning:

Blueprint planning:

- An attempt is made to do enough research to know which management activities will achieve the conservation objective and, armed with this knowledge, put in place a long-term, fixed, management plan

Adaptive management:

- Shows what effects the chosen management is having
- Directs decision-making to make adjustments to the management activities to better achieve the objectives
- Provides information that improves understanding of the system so that management strategies can be more easily devised

Wildlife management suffers from a lack of strong theoretical under-pinning. However, even where there is a good understanding of ecological processes, there are differences between sites and environmental fluctuations over time that makes predictions difficult, if not impossible. Under these conditions, a blueprint approach cannot work and adaptive management is the only option.

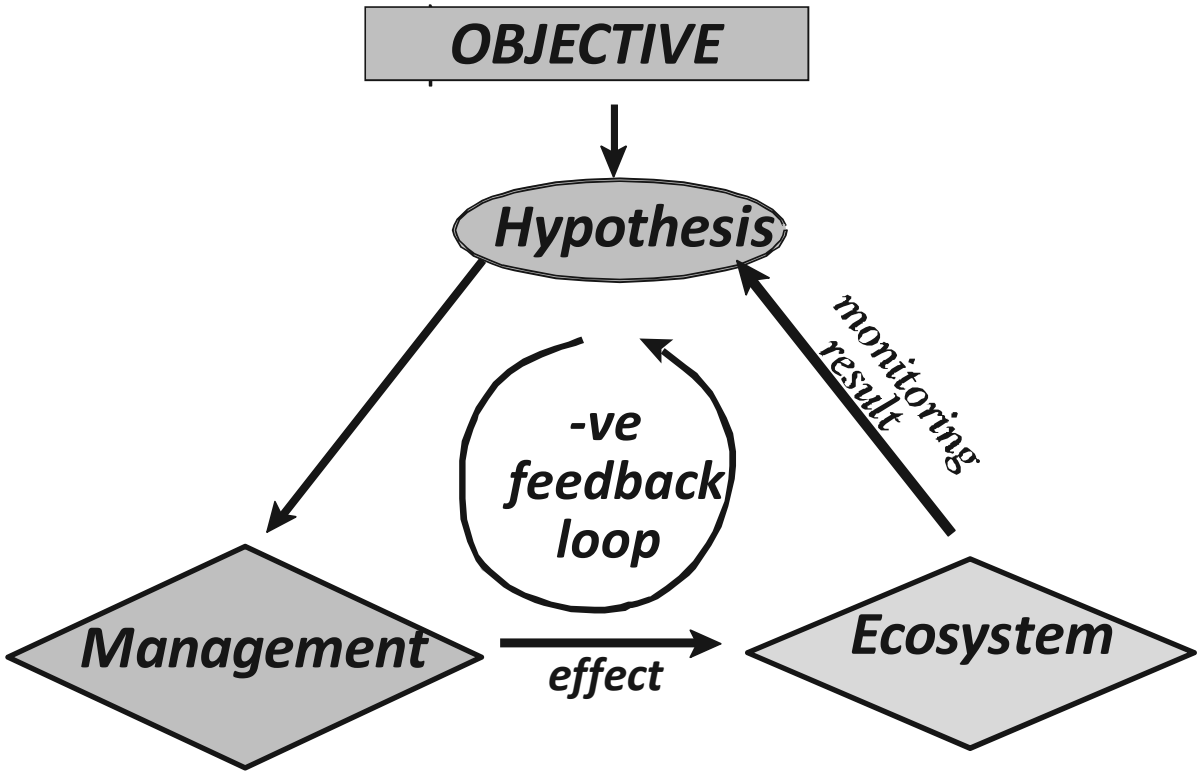
Dr Richard Bell, a well-known ecologist, explained adaptive management as a control process and made the analogy of a ship sailing across the ocean to reach a port on the other side. The position of the ship in relation to its desired course is measured at regular intervals and corrections are made to the steering to bring the ship back on course as necessary until port is reached – a strategy that clearly

works. The blueprint approach to this problem would necessitate detailed knowledge of winds and currents over the whole course and the ship could be steered accordingly without any positions fixes being taken en route. This is not a working, real-world solution to the problem of getting the ship to where the captain wants to go.

Adaptive management is, in fact, the approach routinely used in everyday life to reach solutions to practical problems: experience of what works and what doesn't is as important as detailed technical knowledge.

Adaptive management is a systematic and iterative way of improving resource management that acquires learning by monitoring management outcomes. It is a planned way of determining how to improve management practices over time in the face of uncertainty.

Adaptive management can be represented as a negative feedback loop as shown in the following diagram:



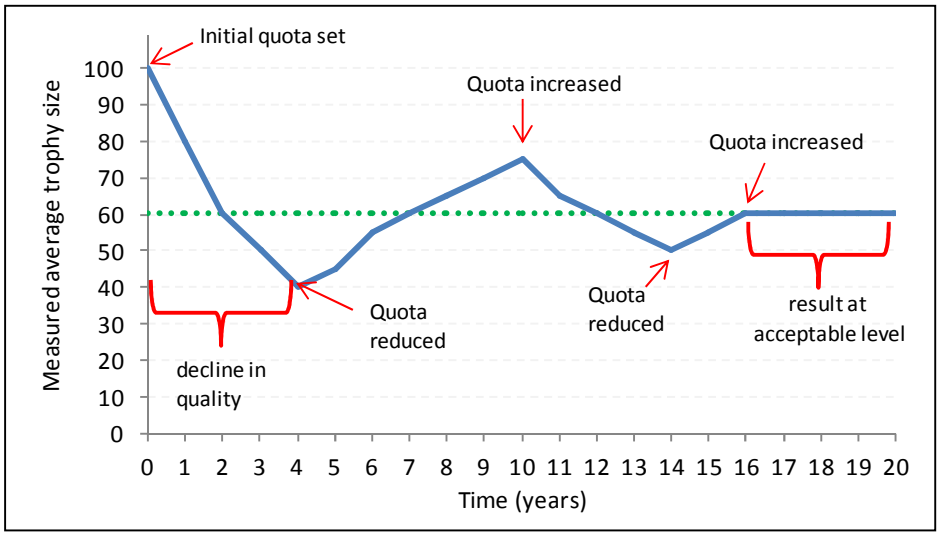
This diagram shows that, based on a management objective, a management strategy is decided on based on an initial hypothesis about how the system works. The management changes the system in some way that is measured by monitoring.

The hypothesis can be changed based on this result and the management modified so that the next result takes the system closer to the objective. Over a series of these cycles of management → monitoring → evaluation, the management is fine-tuned until the objective is reached. Adaptive management is, therefore, not just a way of reaching management objectives: each intervention is a scientific experiment which tests the hypothesis used to decide on management. In this way, the desired endpoint is reached and a technical understanding of the system is also gained.

Objectives might be, for example:

- A maximum sustained yield from a cropping programme
- An optimal state for a grazing system
- A desired average trophy size from safari hunting

The latter might be reached through a process illustrated as follows:



ADVANTAGES OF THE ADAPTIVE MANAGEMENT APPROACH

It isn't necessary to understand the system at the outset – as in the real world decisions are based on imperfect information:

- It enables timely intervention when a situation is fast-changing.
- Results of management and monitoring will provide an understanding of the system
- Adaptive approach homes in on the objective – the blueprint approach is hit-or-miss

It must be stressed that adaptive management requires rigorous adherence to the principles and there are few examples of this being done effectively in practice: people prefer plans that do not change regularly. Nevertheless, it is indispensible to good future wildlife management and a better understanding of the system we are dealing with.

To achieve this end, it is important for management plans to go beyond a mere statement that adaptive management is the policy and describe and institutionalise the process by which it will be achieved. It is therefore essential that plans have clear objectives, progress towards which will be monitored and an identification of the responsibilities for, and the timings of monitoring, review of results and decisions on further management

Handout 2

WILDLIFE MANAGEMENT AND UTILISATION PLANNING

BACKGROUND INFORMATION

INTRODUCTION

Management of natural resources is complicated because it involves many variables (wildlife, livestock, veld, fire, rainfall, etc). This is made even more difficult because management also depends on the objectives of the community. For example the same area could be used for cattle production, game-farming, tourism, crop farming or a mixture of all of these. On top of all of this it is not possible to have complete knowledge of the ecosystem we are managing.

As a result of the complexity it is not possible to have a management recipe. Instead, a process called **Adaptive Management** is used. This simply means that management plans are drawn up based on what we know now (using a natural resource inventory). The area is then managed according to these plans but at the same time, monitoring systems check to see if the objectives are being reached. The monitoring information is also used by the management committee to improve management or if necessary, change objectives.

Many areas can be, and are, managed without formal management plans. Best practice dictates, however, that management plans be placed within a formal written framework, but this does not necessarily imply that these need to be lengthy academic documents. Past approaches have tended to produce large and complicated documents, which have almost immediately been ignored by conservancy managers. This is also true for the management of protected areas. In this instance, best practice will be to simplify, not complicate, management planning. It is currently believed that best practice will produce a management plan, which consists of a few critical tools that will be used on a regular basis to guide management.

WHAT IS A MANAGEMENT PLAN?

A Wildlife Management Plan is a document or 'manual' that contains the management principles and details of how the conservancy's wildlife will be managed. It is intended to assist in land management decisions and to establish best practices for managing wildlife within the conservancy. Using available scientific information, monitoring and local knowledge, a plan enables members of the conservancy to maximise benefits from wildlife utilisation while reducing or managing the negative aspects of sharing the land with wildlife.

There are a number of "lessons" that have been learnt from developing management plans in conservancies:

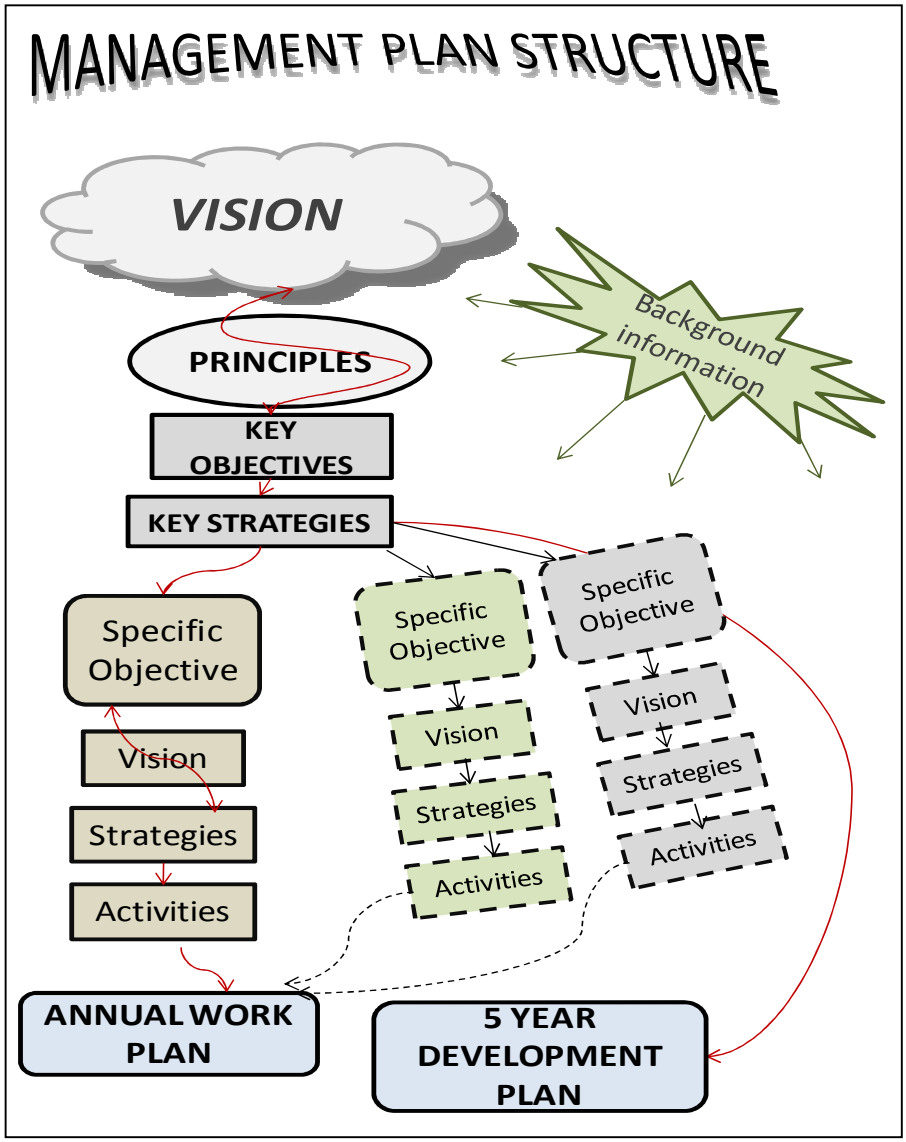
- Management plans should be useable
- Management plans should be concise – where possible information should be summarised in point form, tables, calendars, maps and even posters
- Background information (constitution, check lists, policies, operational plans etc.) should be placed in appendices
- All key stakeholders should be included in the planning process
- Plans should be realistic (cost-benefit done for each strategy – this need not be complicated: see page 8 for an example)
- Limits on skills and legal powers should be taken into account
- Environmental and market limitations must be recognised
- An effective monitoring system (event book) must be maintained
- Management plans should be agreed by all members and formally approved by the conservancy
- Management plans are never completed and should be structured so that changes and additions can be made easily.

WHAT DOES A MANAGEMENT PLAN CONTAIN?

A plan can be broken down into a few basic elements. The following is a useful guideline:

- An overall vision statement (how the members would like the conservancy to be in the future)
- A list of guiding principles
- A list of key objectives to make the vision a reality
- A list of key strategies to achieve the objectives
- A summary of background information about the resource base
- Strategies for individual objectives
- Activities to achieve objectives
- Annual work plan
- Development plan (usually 5 year)
- Appendices containing policies, constitution, check lists etc.
- Detailed operational plans (e.g. water management, reintroduction, human-wildlife-conflict etc.) can be kept together in appendices or separate files

The structure of a plan is summarised in the following diagram:


MANAGEMENT PLAN STRUCTURE
VISION
Background information
PRINCIPLES
KEY OBJECTIVES
KEY STRATEGIES
Specific Objective
Vision
Strategies
Activities
Specific Objective
Vision
Strategies
Activities
Specific Objective
Vision
Strategies
Activities
ANNUAL WORK PLAN
5 YEAR DEVELOPMENT PLAN

HOW IS A MANAGEMENT PLAN DEVELOPED FOR A CONSERVANCY?

The supporting technical advisor (could be NGO, MET, consultant etc.) should arrange a two-day workshop with as many stakeholders as possible. They must be asked beforehand to gather all the available information they may have, and, importantly, they should invite those members of the community that are likely to have extensive field knowledge (community game guards, farmers). Relevant bits of information will be drawn upon while developing the plan.

Main Section

The workshop should proceed through a number of steps.

- Stakeholders should asked about their livelihoods to establish main interests and limitations on wildlife utilisation
- Brief check list of important wildlife species drawn up
- Discussion of how stakeholders see the future of the conservancy leading to discussion of the conservancy's overall vision for wildlife management
- Detailed wording of vision agreed upon

e.g.

OVERALL VISION

Doro !Nawas' wildlife are restored to former levels and are sustainably managed and utilized for the economic and cultural benefit of present and future generations.

- Discuss basic principles that should be complied with (ethical hunting, adherence to quotas etc.)

e.g.

KEY PRINCIPLES

- ***An adaptive management system will be used to manage wildlife in Doro !Nawas. This means that the management strategies (in this management plan) will be regularly reviewed using information from monitoring systems, and changed if necessary***
- ***Veld condition and livestock are important and game population numbers will be encouraged to increase but not exceed levels that damage veld or impact negatively on livestock in the farming area.***
- ***Doro !Nawas experiences severe and regular droughts. Management will***

avoid mass mortalities during these droughts by occasional removal of large numbers of common game, particularly ensuring that sufficient forage is left for valuable species such as black rhino.

- *Where possible (in the exclusive wildlife areas) the historical range of wildlife species should be present but dangerous game should preferably not be in the farming and settlement areas of the Conservancy.*
- *Poaching will be viewed by Doro !Nawas as anti-social behavior and this attitude will be developed through education and awareness backed up by positive economic benefits such as income, meat, and employment in the wildlife & tourism sector.*
- *The increase of all species will be encouraged while trying to manage and reduce the conflict between people and wildlife (in particular large predators and elephant).*

- Discuss what objectives will be needed to achieve the vision

e.g.

KEY OBJECTIVES

1. *To increase the numbers of existing wildlife species and to re-establish populations of certain wildlife species that have become locally extinct (e.g. red hartebeest)*
2. *To manage human-wildlife conflict*
3. *To involve and increase the understanding of the Community in wildlife management and the benefits that are derived.*
4. *To obtain real benefits from wildlife populations*
5. *To control game numbers with due recognition of rangeland conditions, climatic variability, and competition with rare wildlife species and with livestock.*
6. *To manage according to good data derived from monitoring systems that provide information on rainfall, rangeland, game harvesting levels, game introductions, water distribution, poaching activity and any other management actions that may impact on game populations.*

- To achieve each objective, list the strategies that should be followed

e.g.

KEY STRATEGIES

- *Separating conflicting forms of wildlife and land-use through zoning the area*

- ***Increasing game populations through good management & encouraging natural population increase***
- ***Law enforcement***
- ***Water management***
- ***Game introductions***
- ***Encouraging natural immigration from surrounding areas***
- ***Utilising wildlife, controlling numbers and reducing competition with rare wildlife species and with livestock through sustainable own use harvesting, sustainable trophy hunting and tourism development***
- ***Monitoring to get information***

- Take each of the Objectives and expand the strategies that will achieve them

e.g.

OBJECTIVE 2: To reduce Human-Wildlife Conflict

STRATEGIES:

- ***Ensure settlement and farming does not take place in the exclusive wildlife zones***
- ***Protect all water points from damage by elephant***
- ***Provide alternative water for elephant to keep them away from homesteads / kraals***
- ***Use techniques such as chili bombs to keep elephant away from gardens and homesteads***
- ***Ensure livestock are kept in secure kraals at night to protect them against lion, hyaena, jackal and leopard***
- ***Where possible use herders or guard dogs to protect livestock against attack from predators (mostly cheetah and jackal) during the day***
- ***Keep close watch over juvenile livestock, particularly small stock***
- ***Implement an early warning system for lion, should a pride move into a particular area – giving people an opportunity to take special care to kraal their animals at night***

- Discuss what activities will be needed and list them, with time lines and allocation of personnel

e.g.

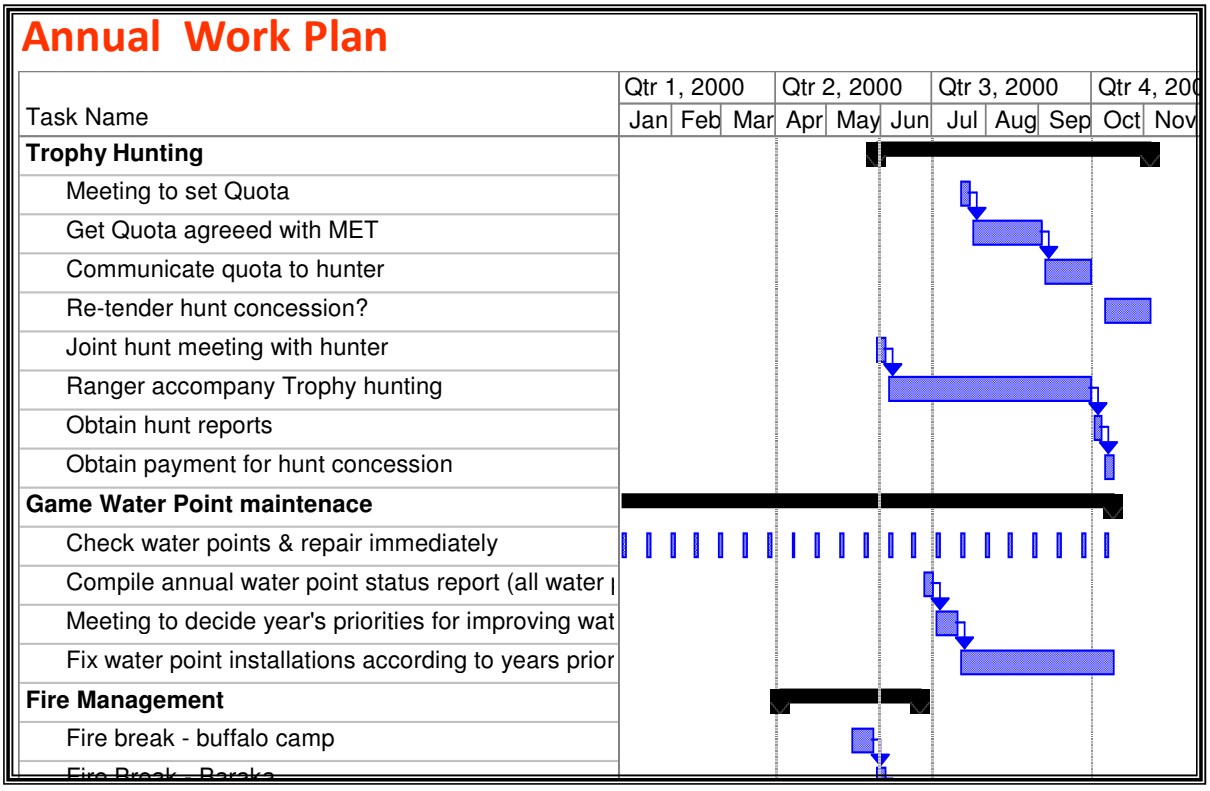
Actions	Timing
1. Finalize, agree and enforce the zonation map	By Nov 2012
2. See water plan for actions to protect water points	Jan 2011
3. Investigate use of Chili Bombs – consult with Caprivi colleagues	July 2011

4. Develop a practical plan to systematically over-time build protective kraals for livestock	By Sep 2011
5. Investigate the practicality of establishing a self insurance scheme for HWC	By July 2012
6. Develop or obtain and circulate a information brochure/poster on how community farmers can minimize HWC	Before AGM 2011

NOTE: A crucial part of management planning is the development of a practical zonation plan. This is dealt with in a separate detailed document

Annual Work Plan

The annual work plan should be developed by going through the activities chosen in the main section, breaking them into detailed actions and allocating times at which they will be conducted.



Development Plan

A development plan usually covers 5 years at a time and generally refers to activities that require significant investment in both funds and effort. .

Development Plan

	Year 1	Year 2	Year 3	Year 4	Year 5
Improve Nat Resource Base					
Introduce game					
Develop new water pts					
Establish CGG system					
Select CGG's					
Train CGG's					
Establish Conservancy Office					
Erect building					
Furnish office					
Obtain Computer					
Income Generation					
Secure Trophy-hunting contract					
Build Community campsite					
Secure Joint venture lodge					
Build Community lodge					

These should relate to the objectives that have been established in the management plan and must be realistic. To assist with this, it is also advisable to draw up a cost-benefit table which will show whether the development is actually feasible.

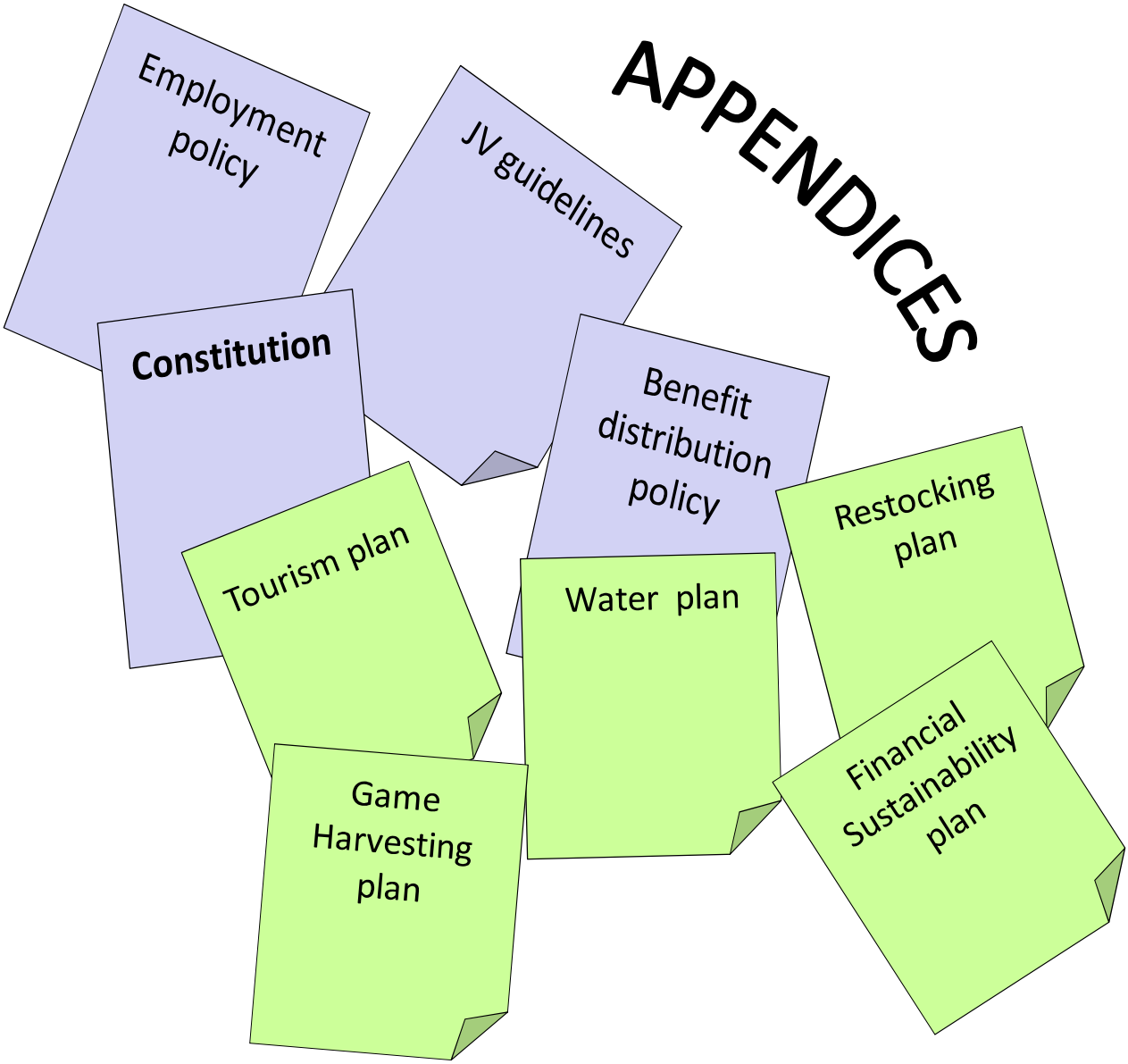
Cost-Benefit Table

Activities	Benefit	Costs
Improve wildlife · **Re-introduce game** · **Develop game water points**	Improve the area for tourism and trophy hunting which has the potential to generate N$850,000 per year.	**N$800,000 for game, N$200,000 for water points. Game will take 10 years to build up to target levels.**
Establish Game Guard System	Reduce poaching and collect monitoring data necessary for adaptive management	**N$30,000 for training and equipment. Also remember recruitment & management costs**
etc	etc	etc

TOTAL DEVELOPMENT COSTS

The Appendices

In the past, the background information for a management plan was included in the main body of the document and often made the plan cumbersome and difficult to use. It is recommended that each of the various documents that make up the baseline information should be kept as separate appendices so that they don't distract from the main strategies of the plan. These appendices will include rules, policies, regulations, agreements, checklists and operational plans.



IMPLEMENTATION MANUAL:

ZONATION

Note: THIS DOCUMENT PROVIDES A GUIDELINE FOR DEVELOPING A ZONATION MAP WHILE ALSO PROVIDING BACKGROUND INFORMATION FOR NEW COMMITTEE MEMBERS TO UNDERSTAND THE PROCESS WHICH THE CONSERVANCY UNDERTOOK TO DEVELOP EXISTING ZONATION PLANS

Who to involve: Traditional leaders, Committee, Rangers and external stakeholders (i.e. Government departments, NGOs, etc)

OBJECTIVES:

1. Produce a land use zonation map for the conflicting land uses within the conservancy.
2. Draft a description of each management zone taking care to detail:
   a. the advantages of each zone
   b. the activities which are permitted in each zone;
   c. the activities that are strongly discouraged in each zone; and
3. Establish a way forward with specific follow up steps that will need to be taken to establish the zonation in practise.

ASSUMPTIONS:

1) That the workshop participants adequately represent all sectors of society in the conservancy, there is gender balance and that all relevant stakeholders from government NGOs and any other sectors are adequately represented.
2) Adequate basic maps are available (see list of materials) in large format.
3) The conservancy's vision and objectives are available (even if only in draft form).
4) Some of the earlier management planning work has already been done and the participants are familiar with the management plan format that they are trying to build.

PROCEDURE:

1) **Introductions** & name tags
2) **Circulate attendance register.**
3) Provide a **background** and recap on the management plan poster. Point out the zonation map and indicate that the objective of today is to create this tool for the conservancy. Point out that the zonation task will involve a process of steps and will be an ongoing process that will require constant feedback to the community in general and ongoing modification. Refer to the General guidelines for further points to make.
4) **Brainstorm the important land uses** that are likely to take place in the conservancy. Get the meeting to list a number of current and future land uses in the conservancy: e.g. cropping, livestock, tourism, trophy hunting, wildlife, veld product harvesting, etc.
5) **Capture these land uses onto a matrix**. Use the matrix to identify the areas for conflict if differing land uses were to take place on the same piece of land (refer to the example of a land use conflict matrix).
6) **Break into a number of groups** of around 10 individuals each. Each group should be provided with a set of maps, colour pens and tracing paper overlays (See MATERIALS LIST).
7) Each participant in the group should now **familiarize themselves with the maps**. Do this by getting each member to point out major conservancy features, the neighbouring areas and locating the exact position on the map where they live. If the various maps are at different scales then get the group to cross-reference the same features on each of the different maps.

8) The groups are then allocated one or two land uses and given the task of **identifying appropriate zones** as follows:
   a) firstly **allocate the respective land use zones** according to the appropriate supporting environments. For this exercise assume that you have a clean slate – i.e. you simply focus on placing cropping on good soils, tourist sites in scenic areas, settlement areas close to bulk infrastructure, etc) - this is obviously a theoretical and idealistic view! Draw these idealistic zones onto tracing paper map overlays a different colour for each land use.
   b) Now indicate, within each land use area, **the priority areas** for that land use activity [Each land use is drawn on a separate piece of tracing paper or plastic sheet].
   c) When each of the land uses has been drawn onto various sheets of tracing paper take the sheets for those land uses that conflict (use the conflict matrix developed earlier) and **overlay them on top of one another**.
9) Get all the groups to report back to the main forum and then:
   a) **Identify where the zones conflict** with one another. Now focusing on where there are areas of conflict:
      i) if the area is high priority for one land use but low priority for the other then let that area be for the former land use;
      ii) if the area of conflict is at the same level then discuss and come to consensus about how to allocate the area; and
      iii) during this process consider the existing land use, the zonation of neighbours and the net beneficial effect of changing the land use – i.e. be realistic and pragmatic.
   b) as this process unfolds draw the final outcome onto a sheet of tracing paper (i.e. merge all of the independent sheets of tracing paper onto one map). This process can take a long time and involves a lot of give and take. Try at all costs to defuse conflict by making compromises. Remember that the conservancy has very little powers to enforce a particular zone so be practical.
10) Now discuss and write down on flip chart the rationale (the advantage) of each zone and **what will be 'allowed' and 'disallowed'**. Design a set of incentives and disincentives in order to achieve the zonation – e.g. only problem animal incidents that take place in the designated cropping zone will be attended to (see the example from Kwando Conservancy).
11) Carefully consider and **design a strategy that will be followed in order to achieve each zone**. Be specific about the steps and consider the details of each step – e.g. identify affected households and where necessary design 'compensation packages' .
12) **Next steps**
   a) Now agree and record on flip chart a process whereby the entire zonation map will be taken forward. Detail the specific steps and allocate tasks to individual people with associated deadline dates. Remember that the key issue is to obtain traditional leadership and general community buy in. Be prepared for changes. The greater and more influential the initial stakeholder group the easier will be this step. This step will take months and will entail exhaustive consultation.
   b) One of the next steps will be that the technical team will capture the draft zonation map onto GIS and make a poster showing the map and the associated supporting text and bring this back to the conservancy as soon as possible so the that community and traditional leadership feedback process can begin.
   c) Set dates for the next event
13) **End** - Take a photograph of the group (for the zonation poster) and close the workshop

LIST OF MATERIALS:

1) **Stationary & supplies**
    - Flip chart stand and paper
    - Masking tape (also use for name tags)
    - Flip chart pens
    - White board marking pens (various colours)
    - Prestick
    - Large sheets of tracing paper or clear plastic for overlaying over the maps
    - Attendance register for collecting participants names and details
2) **Management plan poster**
3) **Maps**
    - A main base map of the conservancy showing roads, rivers, boundaries, settlements, and terrain (min A2 preferably larger).
    - Supportive maps such as a vegetation/habit map and a map showing cropping areas.
    - A satellite image or auto-photo at the same scale as the main base map.
    - Small format zonation maps of neighbouring areas so that the zonation can be integrated with that of the neighbours.

GENERAL GUIDELINES

It is crucial that zonation be tackled in a positive light – i.e. emphasise the positive: e.g. "by zoning we can add this livelihood opportunity". Unfortunately, the tendency is to focus on the negative impacts of zonation as highlighted by those members of the community who become disadvantaged. These impacts needs to be balanced against the community good, and the disadvantaged handled sensitively, and with adequate compensation.

Zonation should be tackled as soon as possible because as development advances there becomes less and less room to manoeuvre.

It is often the case that the zonation map does not match the reality on the ground. This is not a problem because the zonation map is a vision for the future. The difference between the envisaged zonation and the actual situation is what management needs to focus their attention on. The key management objective is to achieve the desired state as drawn on the zonation map. This may take many years and presently, because conservancies do not have legal powers to enforce this, management will have to resort to creating a set of incentives and disincentives in order to encourage people to implement the zonation. Working closely with traditional authorities is critical in this respect.

Of course it is also possible to 'zone in time' meaning that the zonation map changes depending on the time of year (e.g. part of a tourist zone may be set aside as a hunting zone during some of the winter months). When zonation

includes a time element, it will be necessary to have a zone map for each time of year.

The zonation map will also change over time as the Conservancy develops. This means that it is impossible to develop a final zonation map. The practical consequence is that we should not wait until a perfect zonation map is in place. Waiting will simply retard progress. The idea is to get a draft on the table as soon as possible because only once a draft is available will people be able to react to and make suggestions for improvement.

A good zonation map will also have a key explaining the rationale for each zone and detailing what is allowed and disallowed (or discouraged) in each zone. If current land uses in a particular area is not presently compatible with the envisaged in the zonation (e.g. farmers presently farming in a wildlife zone) then this should be clearly identified a transition strategy outlined.

Zonation is an important tool to reduce conflicts and should be promoted through a set of incentives and disincentives.

Appendix 1
Example of a land use conflict matrix

	Livestock	**Tourism**	**Trophy Hunting**	**Wildlife**	**Settlement**	**Veld / wood products**
Cropping	**xx**	XX	**xx**	XX	**++**	**xx**
Livestock		**xx**	**xx**	**xx**	**++**	**xx**
Tourism			**xx**	**++**	XX	**xx**
Trophy Hunting				**++**	XX	---
Wildlife					**xx**	---
Settlement						**xx**

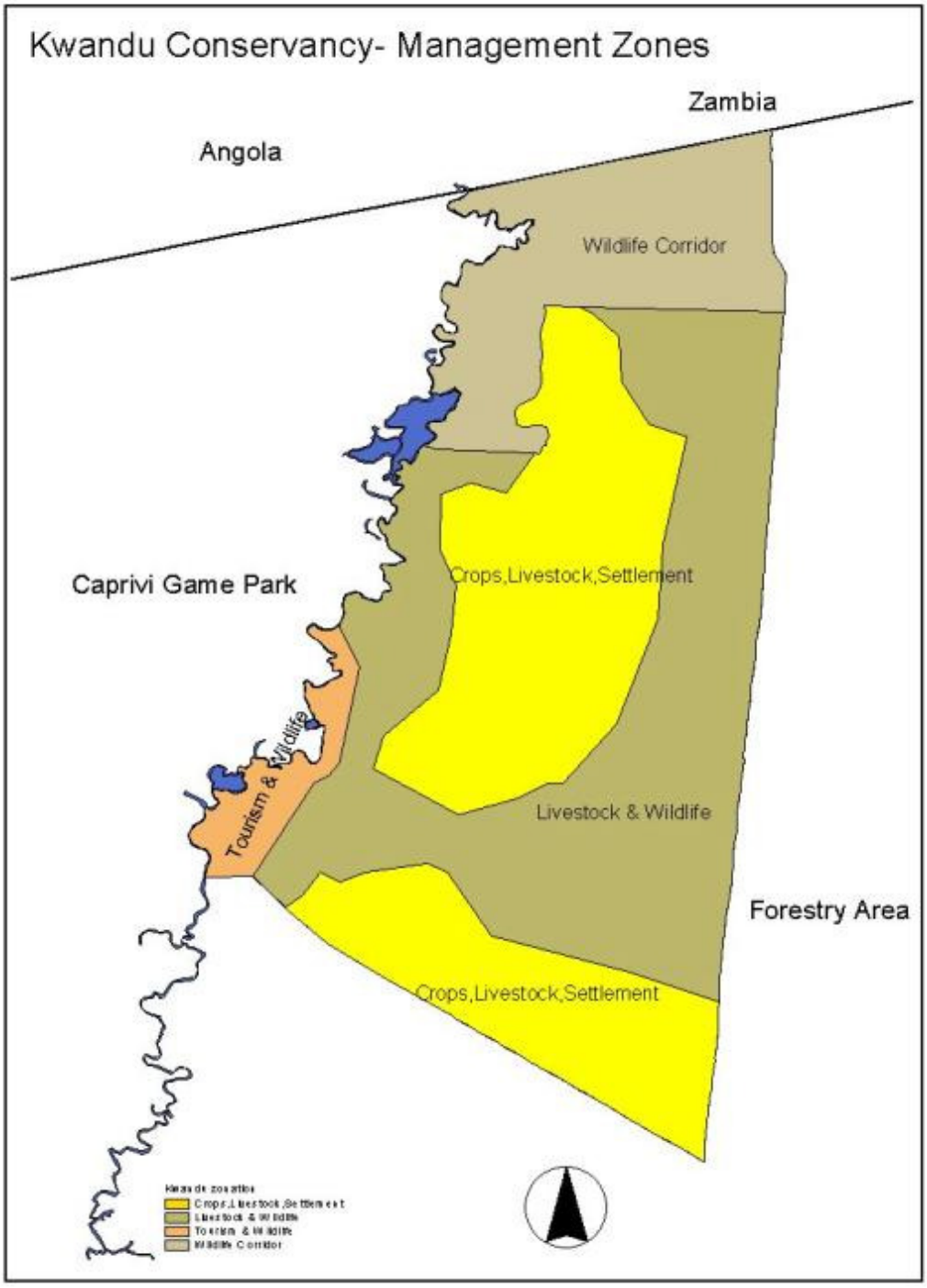
--- no conflict between land uses
xx conflicting land uses that can be managed
XX conflicting land uses that are extremely difficult to manage together
++ land uses assist one another

SUMMARY		
Avoid	Wildlife	Cropping
	Tourism	Cropping
	Tourism	Settlement
	Trophy hunting	Settlement
Encourage	Wildlife	Tourism
	Wildlife	Trophy hunting

Manage	Livestock	Cropping
	Tourism	Livestock
	Trophy hunting	Cropping
	Trophy hunting	Livestock
	Trophy hunting	Tourism
	Wildlife	Livestock
	Wildlife	Settlement
	Veld and wood product harvesting	Cropping, Livestock, Tourism & Settlement
Essentially need to: separate: **[Wildlife/Tourism/Hunting]** from **[Cropping & Settlement]**		

Appendix 2

Example of a zonation map (from Kwando Conservancy)



Appendix 3

Example of a zonation key – i.e. detailing the rationale and land use guidelines for each zone.

ZONE 1: Wildlife Corridor and Tourism Development Zone

Advantages:
- Wildlife corridor between protected area (West) and Forest (east)
- Tourism Development
- Space for wildlife
- Helps conservancy to negotiate with MET (DRM & DoF)
- Links to Zambia wildlife areas
- Raises Kwando's conservation profile

Allowed:
- Wildlife
- Tourism
- Harvesting veld products
- Fishing
- Trophy hunting

Not allowed:
- Settlement
- Cropping
- Minimum livestock

Strategy
- Discuss with traditional leaders
- Discuss with community members
- Negotiations with Len Ward
- Discuss with Zambian Neighbours
- Promote corridor idea through publications

ZONE 2: Livestock & Wildlife Zone

Advantages:
- Give space for wildlife and livestock
- Provide opportunities for tourism and hunting

Allowed:
- Livestock grazing
- Wildlife
- Tourism
- Hunting
- Fishing
- Veld products (thatch, reeds, trees)

Not allowed
- No (new?) settlement
- No (new?) cropping

Strategy
- Get agreement from individuals

ZONE 3: Tourism & Wildlife Zone

Advantages:
- Provides tourism development opportunities
- Provides space for wildlife
- Provides protection of river bank and development opportunities in protected area

Allowed:
- Tourism development
- Fishing
- Wildlife
- Veld product harvesting

Not allowed:
- No hunting
- No cropping
- No settlement
- Minimise livestock

Strategy:
- Discuss with indunas
- In future, discuss with private developers
- Discuss with MET, army, agriculture etc. on stopping developments in this zone
- Discuss with Jack - rules et.

ZONE 4: Crops, Livestock and Settlement Zone

Advantages:
- Gives space for wildlife, livestock and cropping
- Gives space tourism development
- Easier to implement problem animal strategy
- Easier to provide people with services (schools, clinics, water electricity)

Allowed:
- Settlement
- Livestock
- Cropping
- Services (schools, clinic, shops…)

- Veld resources

Not allowed:

- No hunting

Strategy:

- Communicate plan to community
- Discuss with indunas and agree implementation
- Develop problem animal strategy for these

Handout #4

GAME VALUE

BACKGROUND INFORMATION

INTRODUCTION

Conservancies in Namibia have been given the authority to utilise their wildlife populations for the benefit of the communities living in the area. This does not preclude the continuation of traditional forms of livelihood – farming, livestock and crop-growing but rather is an additional activity that can be used as a supplementary communal income for the benefit of all. Returns from wildlife can be distributed among the individuals in the community or used to develop infrastructure, job creation, training and natural resource management for the benefit of the community as a whole. To demonstrate that wildlife management and sustainable utilisation is a competitive land use option, the benefits that can be derived from wildlife management are combined for comparison with the benefits from other land uses. This is known as "game value".

There are different ways in which wildlife can be used, depending on the species in the area, their environment and their population dynamics. To get the best returns from wildlife, managers apply as many forms of utilisation as possible.

BENEFITS FROM WILDLIFE

Benefits derived from wildlife utilisation can be classified into "tangible" and "intangible" as shown in Table 1.

Table 1. Benefits from wildlife utilisation

TANGIBLE BENEFITS	***INTANGIBLE BENEFITS***
Payment in cash from: • Conservancy income • Jobs • Household dividends • Craft sales • Guiding • Sale of food & drinks to tourist	These include: • Increased individual capacity, experience, ability etc • Institutional strengthening • Increased opportunities • Cultural value of wildlife • Improved knowledge of wildlife • Pride in restoring and maintaining wildlife • Recognition for good wildlife management • Good environmental management & biodiversity maintenance • Improved ecosystem services from
Payment in kind from: • Meat • Communal infrastructure • Support for orphans & the aged • Schools • Support for youth groups	

The relative advantages of wildlife management and utilisation (alongside traditional land-uses) *versus* other land-uses such as livestock farming vary from place to place, depending on the resource base. Most of Namibia is unsuited to intensive farming of any kind because

of the low, variable rainfall and poor soils. Wildlife, including large mammals is better adapted to the harsh conditions found in much of the land and is therefore more productive and less vulnerable to the unpredictability of the climate. The land is able to support a larger biomass of wildlife than of domestic stock because a variety of species can exist together by feeding on different vegetation. Most wild species have resistance to diseases that may harm domestic animals, some do not need to drink and some can survive extreme temperatures that would kill other animals.

With the spectacular scenery found in many conservancies as an additional draw card, wildlife is increasingly important as a tourist attraction in conservancies. Trophy hunting also brings in significant fees, particularly for some of the more desired species such as elephant. To a lesser extent, other types of hunting also benefit the conservancies and the best returns often come from combinations of these varied uses of wildlife.

Communal conservancies that manage wildlife have additional advantages over commercial farms because:

- They are large and unfenced, they are more productive and resilient
- They are more attractive for the "wilderness" experience popular with tourists and offer beautiful scenery
- They can offer tourists a glimpse of traditional Namibian lifestyles through "living museums"

TYPES OF WILDLIFE UTILISATION

There are basically two classes of wildlife utilisation: consumptive and non-consumptive. As the names imply, consumptive results in the removal of the animal from the area while non-consumptive use brings benefits but the animals remain. Examples are shown in Table 2.

Table 2. Examples of utilisation and benefits

CONSUMPTIVE UTILISATION		***NON-CONSUMPTIVE UTILISATION***	
Type	Benefits	Type	Benefits
• Trophy hunting • Premium (sport) hunting • Harvesting • Shoot & sell hunting • Own use hunting • Live capture for translocation & sale	• Cash • Meat • Hides • Horns/warthog & hippo tusks • Traditional medicine • Infrastructure • Assistance with HWC • Assistance with hunting activities	• Tourism	Cash & experience from • Accommodation • Food & drinks • Transport • Guiding • Activities (e.g. ballooning) • Cultural villages / crafts
		• Environmental education • Research	

Tourism in the form of joint-venture operations (particularly lodges and campsites) brings in the greatest revenue (generally over 50%), followed by trophy hunting with the other sources of income from wildlife utilisation making up only about a quarter of the total revenue (eg Fig. 1).

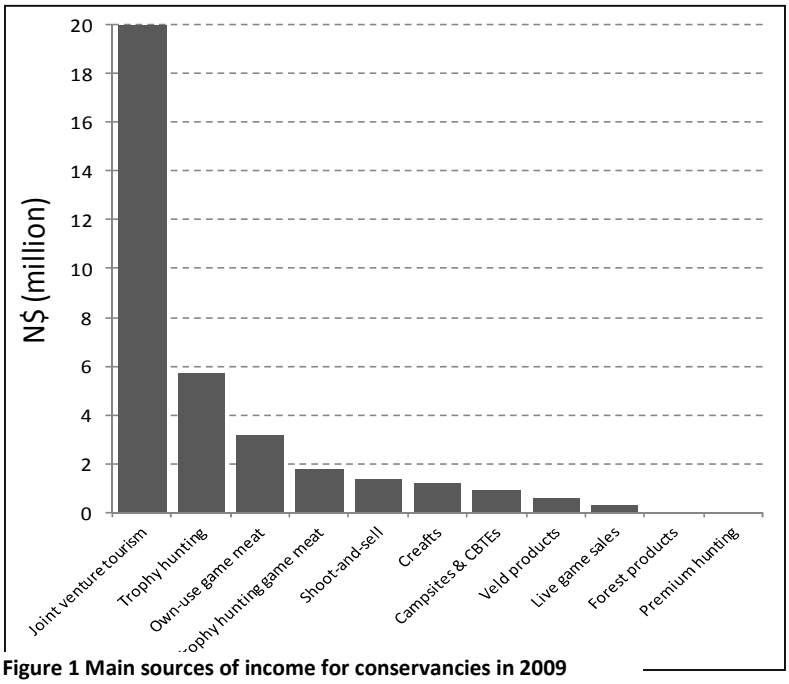


Figure 1 Main sources of income for conservancies in 2009

Benefits from various types of utilisation depend on location, size, resources, efficiency of management, but are likely to appear similar to the scale shown in Table 3.

Table 3. Example of the relative scale of benefits from wildlife utilisation (from training manual)

TYPE OF WILDLIFE UTILISATION		TANGIBLE BENEFITS					
		Cash (N$)	**Jobs**	**Meat**	**Infrastructure**	**Social support**	**Other**
Trophy hunting		medium to large	small	small to medium	zero to small	small	Assist with problem animals
Sport/premier hunting		small to medium	small	small to medium	zero to small	zero	
Harvesting/culling (large numbers)		medium to large	small	small	zero	zero	NRM
Shoot & sell (smaller numbers)		small to medium	small to medium	small	medium: a.) cool room b.) meat handling facility	small	Value adding, e.g., hides and skins, biltong, smoked meat
Own use		zero	small to medium	medium to large	as above	medium to large	As above
Live capture and sell	**Common species**	small	small	zero/ small	zero	zero	NRM, game swaps
	Rare/high-value species	medium to large	zero	zero	zero	zero	
Tourism	**Upmarket lodge**	medium to large	medium to large	zero	medium	small to medium	Enterprise opportunities
	Mid-market lodge	medium to large	medium to large	zero	medium	small to medium	Enterprise opportunities
	Campsite	small	small	zero	small	zero to small	Enterprise opportunities
	Guiding	small	small	zero	zero	zero to small	

Table 4. Factors affecting values

TYPE OF UTILISATION	POSITIVE IMPACT ON VALUE	NEGATIVE IMPACT ON VALUE
Trophy hunting	• High quality trophy • Wide diversity of trophy species • Quota size • Good relationship with safari operator • Spacious scenery	• Poorly conducted harvesting, shoot & sell, own use hunting (removes trophy animals, makes animals wary, animals move away) • Live capture that removes trophy animals from population
Live sale	• High value species – rhino, black-faced impala, roan, sable • Animals concentrated in one area (or a few) • Animals accessible • Animals south of the vet fence	• Animals widely dispersed • Animals north of vet fence = quarantine required • Animals in poor condition
Meat price	• Animals concentrated in one area (or a few) • Animals accessible • Animals south of the vet fence • Best practices for harvesting & processing carcasses • Nearby lodges • Added value by smoking or drying meat	• Animals widely dispersed • Animals north of vet fence = meat can't be sold to south (or exported)

Handout 6

Guideline for Game Translocations to Communal Conservancies

Introduction

The establishment of conservancies is presenting Namibia with a unique conservation opportunity to re-establish wildlife species into their former ranges. A well-managed wildlife translocation programme is a valuable conservation tool. It has benefits at both ends of the process. In areas that are fully stocked, the capture process is a management tool to prevent overpopulation. Controlling population sizes relieves pressure on the veld, reduces drought-related mortalities and serves to rejuvenate remaining populations. The introduction process re-establishes or boosts game populations so that wildlife-based industries have a chance of competing with alternative forms of land use such as agriculture. This has obvious benefits for incentives based conservation, diversification of the rural economy and poverty relief.

Wildlife introduction is an expensive exercise that requires careful choice of appropriate areas to introduce animals. The success of the translocation depends on the selection of the release areas that imply a multitude of criteria, significant preparation and an appropriate communication between all the stakeholders.

Organizing game translocations to communal conservancies is quite a complex task because it involves many stakeholders, a diversity of game species with individual needs and require a precise and complex logistical planning. The following guideline outlines the various steps of the translocation process that would increase the chances of success at various levels:

1. Game Translocation Preparation

a. Identify Appropriate Species

The wildlife populations in the communal areas of Namibia have suffered from episodes of severe drought and years of poaching prior to CBNRM becoming an effective approach. It is only within the relatively recent past, with the development of the CBNRM programme, that wildlife populations are recovering. Nevertheless, some species have become locally extinct while some remain at very low densities and often these populations are not viable.

Therefore the first step to take before implementing any translocation is to assess the current situation. It is important that the conservancy identifies what species that they would want for the conservancy and to do this they should answer a number of questions. These questions should include:

a) What species are present in the area?
b) How viable are these populations and are they at the levels which are desired?
c) What locally extinct species would bring value to the conservancy and what is the former home range of each species?

d) Does the species meet our biodiversity and economic objectives?
e) Will we able to protect this species against a range of possible threats – poaching, competition by domestic stock etc.
f) Do we have the habitat to support these species and for those species which are dependent upon water is there access to undisturbed water points?
g) What is the attitude of the neighbors to these species? This important question as conservancies are large, open systems and wildlife frequently moves between a number of conservancies and a "landscape" approach is often required.

The "supply partners" (MET, NGOs, donors, private sector etc.) also adopt a rigorous and transparent approach to identifying the suitability of each area and conservancy for game introductions. The MET has a national responsibility to ensure that wildlife donated by national parks has a good chance of survival and contributing to biodiversity and economic objectives of the target areas. Similarly donors need to show diligence in committing funds to what is often a costly exercise.
The MET and partners have developed a screening tool which considers a number of factors to advise the decision making and conservancies are strongly advised to consider the same factors. This would greatly assist with developing grant proposals to MET or donor organizations for support. See Handout 6B.
When we know what species are candidates for introduction into a given area, it is then crucial to meet with the communities and discuss the various introduction options. This is a critical step as MET and donors would like to be assured that there is general support for the investment. Ideally, translocation requirements should be captured in the wildlife management plan which would have been approved by an AGM and endorsed by MET. This would streamline the approval process while keeping translocation needs well-documented in management plans shows the commitment and intent which donors and MET require before making large investments.

b. <u>Baseline data to help decision making</u>

The game translocation specialist team will use a range of data that will help them make their decsions.
Each conservancy makes use of the **Event Book Monitoring**, and conducts **Annual Game Counts**. These data combined will allow the translocation specialists to understand the status of wildlife in the conservancy and will confirm the need to boost existing populations or introduce locally extinct species. It is thus important that local monitoring systems are up-to-date and provide the required data. Local level monitoring is also a good indication of management capacity and MET and donors would have little confidence if the conservancy event book system was not in good order.
The **annual event book audit** provides a strong baseline for both the MET and the conservancy and this can be a powerful tool for the conservancy to demonstrate the management capacity of the conservancy.

c. Game Sources

Although the source of game is usually beyond the sphere of influence of the conservancy it is important to know that, where possible and appropriate, MET has been generous in donating game. This has resulted in large numbers of game animals been made available to conservancies.

Unfortunately, the MET protected areas cannot always satisfy the demand thus, when the budget allows it, some species are sourced from private farms. This obviously has huge financial implications and adds considerably to the cost of translocations.

d. Release site identification

As soon as a translocation plan is approved, the release sites must be identified by the conservancy and the translocation specialist group. The release site must:

- Preferably be in the **Wildlife Zone** in order to avoid any interference with human activities;
- where in a farming area there should be widespread consultation with local residents who need to support the introduction and be prepared to take whatever action required to ensure survival of the animals;
- be close to **permanent water**, in particular for water dependant species;
- have **suitable forage** (grazing or browsing) for the introduced species
- be away **from any settlements**
- be **far from any fence**, to avoid animals to hurt themselves;
- be **far from any steep escarpment**;
- be preferably **accessible by 2x4 truck** (no sandy area, no steep hills to climb) but where this unavoidable special measures must be put in place and MET and operator needs to be made aware of this;
- be accessible by **long truck** (no sharp turn, no rocks on the way); and
- be **cleared of trees or branches** which may scrape the truck.

When the release sites have been identified and agreed by everyone, then the community must ensure that the roads are open (cut trees and bushes) well before the event. If the roads are difficult to access, then it is crucial to ensure appropriate vehicles are available.

e. Stakeholder involvement and communication

The success of the translocation depends on the involvement and commitment of all the stakeholders (conservancies, MET, supporting NGO's and game dealer). Clear and constant communication must be applied at every step of the process, from the decision making to the implementation. Conservancies need to ensure that they identify a contact person for the exercise and that this person is accessible by phone and possibly email.

2. Release

a. Preparation for release

This shall depend on the species to be released but there are general two approaches:

- **Hard release** whereby animals are released directly from the trucks. It is important that conservancy representatives, including the contact person, are present as someone shall need to "sign off" that the animals have been released and to record possible mortalities, sick animals etc. It is also important to note the direction in which they move off as this will help with immediate post-release monitoring.
- **Soft release** whereby animals are released from a truck into a plastic boma for a period of a few hours to a few days. However, conservancies will be informed of the approach and shall be thoroughly briefed on their responsibility.

b. Release protocol

The actual releases take into account a number of factors which are beyond the control of the recipients, but for each release there shall be clear procedures with clearly defined responsibilities. The ultimate responsibility for the release of the animals will lie with the operator (if private sector) or MET official.
Nevertheless it is important that the conservancy is fully informed and understands of what role they are expected to play.

3. Post release-monitoring

The conservancy, in requesting wildlife from either MET or donors, undertakes to actively monitor their movements, mortalities, breeding etc. There are different approaches for different species and these shall be agreed prior to release but the following serves as a guideline:

a. Immediately post release

For a few days immediately after the release there should be an intensified effort to get an idea of the areas to which the animals have disbursed. Care must be taken not to disturb them but it would be useful to try by all means to establish their whereabouts.
When they are in farming areas it is essential to consult local farmers and speak with them and encourage them to provide reports. It may be beneficial, where there is cell phone coverage, to provide farmers with modest cell phone credit so that they may report sightings. This is especially necessary for the first few weeks.

It is also important to check for spoor at water holes. The use of camera traps is also a very useful tool especially where there are few places for the animals to drink.

b. Longer-term monitoring

It may be a good idea to establish fixed walking transects in areas where animals are established and this should be discussed with the wildlife specialists assisting the conservancy.

c. Event book

There is a dedicated event book card for introduced animals and all CGGs (even farmers) must ensure that these are used. Monthly summaries should be completed and, as with all data, should be shared with the MET and other stakeholders for at least the first year after the translocation. There may be exceptions, especially for high value species, but special protocols shall be developed according to the species and area needs.

Introduced wildlife will often be utilized in the future and these data also important especially to show economic impacts of the introduction.

d. Monitoring by lodges

Lodges are potentially very important partners as game drives offer intensive coverage of selected areas and can provide very good data. An event book has been developed for lodges and shall be distributed by wildlife support staff. It is, however, that the conservancy remains in close contact with the various lodges and shows interest in the contribution they are making and visits to share the data. It is best to develop and agree on a procedure with the lodge and, once again, ensure that data are shared with MET and other stakeholders.

Monitoring by lodges also has the potential to show how the introduction has impacted upon the value of the tourism product.

e. Use of satellite, GPS and VHF collars

Occasionally, remote tracking is used for certain species and the responsibility for management of the data, which is often highly complex, shall be decided according to the technology used, species and area. However, it is important that a protocol for sharing data with the conservancy shall be developed.

It is very important for the conservancy to deploy resources to monitor introductions as it not only fulfills a requirement for the conservancy, MET and donors to demonstrate impacts of their investments, but it also demonstrates the conservancy's management capacity. It is equally important to share data with the membership who need to be aware of the successes of the conservancy or who may also need to be aware of what may be constraining the establishment of introduced species.

Handout 6B

Game Translocation Criteria Explanation

Overall Assumption: Genetic Integrity applies.

SOCIOLOGICAL FACTORS	
Criteria	**Factors to be Considered**
What is the management capacity of this conservancy?	• Management Plan • Monitoring System • Adaptive Management Responses • Zonation • Dedicated Water • Wildlife Zonation • Anti poaching • Staffing
How good is this conservancy's track record?	• Failures and response to failures • Successes • Co-operation • Planning • Reporting

ECONOMIC FACTORS	
Criteria	**Factors to be Considered**
What is the tourism potential of this conservancy?	• Attractions • Access • Marketing
What is the potential for Trophy Hunting in this conservancy?	• Attractiveness of area – for marketing hunting
What is the game breeding potential in this conservancy? (i.e. venison production or live sales)	• Veterinary regulations • Access to marketing • Ease of off-take/capture • Carrying capacity of the area (leading to high game density)
How critical is Own-Use in this conservancy?	• Protein need (e.g. low livestock numbers) •
How much would translocating game improve livelihoods of people in this conservancy?	• Score high if high poverty levels • Lower if other livelihood options currently active in the area

Handout 6B

THREAT FACTORS	
Criteria	**Factors to be Considered**
Rate how safe introduced wildlife will be from threats coming from within the conservancy.	• Predation • Poaching • Emigration of wildlife • Plans for competing forms of land use • Internal strife among the people.
Rate how safe will the conservancy and introduced wildlife be from threats coming from outside the conservancy.	• immigration • unsupportive neighbours
NATIONAL STRATEGY CONTRIBUTIONS	
Criteria	**Factors to be considered**
To what degree is this conservancy critical to the achievement of national conservation objectives?	• Secure key habitats for national biodiversity conservation • Promote wildlife corridors • Promote Conservation buffer zones • Make Wildlife more competitive than alternative land use • Promote trans-frontier conservation areas etc.
How much competition will introduced wildlife endure in this conservancy?	• Human density and settlement patterns • Livestock density and distribution • Presence of Zonation

ECOLOGICAL FACTORS	
Criteria	**Factors to be Considered**
Is the area ecologically suitable?	• Historical range • Rainfall • Habitat
To what degree has the existing population reached optimum capacity in the area?	• Re-establish a population (i.e. locally extinct) • Population boost -consider growth potential vs. available habitat
Is there sufficient access to water for this species?	• Water dependency of species • Water availability – natural or boreholes • Water accessibility for wildlife (competition?)

Handout 6B

ECOLOGICAL FACTORS	
Criteria	**Factors to be Considered**
To what degree will present land uses in this conservancy impact this species?	• Human density and settlement patterns • Livestock density and distribution • Presence or absence of Zonation
To what degree might the cultural value of this species reward or enhance the commitment of the people?	

ECONOMIC FACTORS	
Criteria	**Factors to be Considered**
Will an introduction of this species greatly improve tourism	• Consider value of each species to tourism, and relate this to current population levels
Will an introduction of this species greatly improve Trophy Hunting?	• Range of species presently available • How addition of species would raise value/attractiveness to trophy hunters
Will an introduction of this species greatly improve other consumptive uses?	•
NATIONAL STRATEGY CONTRIBUTIONS	
Criteria	**Factors to be Considered**
To what degree does introducing this species into this conservancy support the national strategy for this species?	• knock-on impacts at regional and species levels (breeding core populations, source for re-introductions) • links to National Species Management Plans, Regional Conservation Plans etc;

Handout 7

QUOTA SETTING

NOTE: This handout contains information of varying technical complexity and thus can be used for and by variety of audiences. It contains the essential ingredients for quota-setting as well as more detailed explanations of an off-take model

BACKGROUND INFORMATION

INTRODUCTION

Good management of wildlife populations enables the people that live with them to obtain tangible benefits from them while ensuring that they are utilised sustainably. By registering as a Conservancy, people living in rural communities in Namibia acquire the right to benefit from the wildlife - on condition that they actively look after and manage it. In return for ongoing benefits, each Conservancy is expected to:

- develop and implement a wildlife management and utilisation plan to guide their activities,
- monitor management activities and resources
- use wildlife wisely by setting and adhering to realistic quotas

Because Conservancies are areas in which people live, farm livestock, grow crops and use a variety of other activities for their livelihoods, they need to decide whether or not to have wildlife and, if so, which species and how many.

Where wildlife is likely to compete with other forms of land use, people must be able to benefit from wild animals or they will make their livelihoods from other land uses and have little incentive to maintain their wildlife.

The several types of off-take that can benefit conservancies are summarised in the following table:

OFF-TAKE	**CONDUCTED BY**	**BENEFITS TO CONSERVANCY**
Trophy hunting	Safari operator & sport hunter	Good income; meat
Premium hunting (for sport hunter to kill & photograph)	Sport hunter	Fees, trophy, skin, meat
Shoot & sell hunting	Trained conservancy hunters or commercial hunters	Fees
Own-use hunting (for meat, other products, special occasions)	Trained conservancy hunters	Meat (minus costs)
Problem animal hunting	Trained conservancy hunters or offered to	Problem animal removed; fees if sold to operator

	safari operator	
Live capture for sale	Professional capture operators with conservancy help	Fees
Disturbance hunting	Trained conservancy hunters	Meat; problem animals moved away

Conservancies are not National Parks or Game Reserves and they are therefore managed differently. This can include:

- Rapidly harvesting large numbers to prevent mass die-offs during droughts
- Using a dynamic quota system to allow appropriate harvesting in response to good or poor years (constant off-take quotas are unsuitable for areas in which rainfall is highly erratic and wildlife numbers vary in response)
- Sharing quotas with neighbouring Conservancies for species such as elephant that range over more than one Conservancy

Responsible quotas will benefit conservancies financially and materially while allowing wildlife populations to maintain optimal levels in the long term.

WHAT IS A QUOTA?

A quota can be defined as a proportional part or share of a number of items – in the case of wildlife management, it is the number of animals that is to be taken from a population for some particular reason such as trophy hunting, harvesting for food or reducing the numbers of animals.

WHY SET QUOTAS?

Quotas are set to make sure that wildlife populations continue to survive while providing benefits through various forms of utilisation. These include:

- harvesting – providing a continuous supply of meat to local people
- problem animal control – removing problem animals to reduce human-wildlife conflict
- trophy hunting – allowing sport hunters to kill selected animals for their trophies
- capture for live sales – moving animals from one area to establish a population in another
- culling – to reduce the number of animals

WHAT IS A SUSTAINABLE QUOTA?

What is a sustainable quota for harvesting?

A sustainable quota is the number of animals that can be removed from the population so that repeated *harvesting* produces a sustainable off-take in the long term from a more-or-less constant population.

A sustainable quota for harvesting is either the same as, or lower than the potential natural population increase rate of a population of the desired size. This allows wildlife populations to remain more or less at the same numbers or to recover from a decline.

What is a sustainable quota for trophy hunting?

Some people enjoy hunting for sport and many of them like to collect "trophies" from the animals that they have killed. These can be horns, tusks, antlers or simply the animal's body. The goal is to get trophies that are as good as possible – longest horns, biggest tusks or the largest animals.

Trophy hunting usually targets male animals and often the older ones in the population since these usually have the requisite trophies and size although there can be environmental factors or basic genetics that affect the quality of their trophies. Hunting male animals generally has little impact on the population as a whole, but removing too many can lead to a decline in trophy "quality" (i.e. the size of horns, tusks etc. decreases on average). It must be understood that there are always less trophies in a hunted population than in the absence of trophy hunting. Over-hunting trophy animals can also result in increased difficulty in finding animals with suitable trophies to hunt. This may give an area a bad reputation, trophy hunters will go elsewhere and there will be less income from the wildlife species in question. Trophy quotas are set to ensure that the product remains as good as possible. For commercial reasons, the quota is a compromise between the number of trophies made available and the price at which they can be sold: the choice is between a small number of high value trophies and a larger number of lower quality trophies.

A sustainable quota for trophy hunting allows a proportion of the population of trophy-bearing species to be removed without causing a decline in trophy quality or an increase in hunting effort, beyond what is commercially optimal.

What is a cull?

There may be occasions during which it becomes necessary to reduce the numbers of animals. This may be in anticipation of an excessive die-off due to drought, or it may be intended to reduce competition for resources with livestock or other wildlife species, or to prevent damage to habitats from over-population and so on.

A cull reduces the population size by deliberately using a quota that is greater than the natural growth rate of the population.

WHY SET A QUOTA?

Without a quota there is an increased likelihood of over-hunting, be it for personal use, problem animals or trophy hunting because an upper limit to the number of animals to be taken will not be provided as a guide. In the long term, this will result in a decline in benefits from wildlife for people living in conservancies.

WHAT AFFECTS A QUOTA?

A quota is based on background information such as knowledge of the biology of the species, modified by the outcome of monitoring the population of animals.

Harvesting quota

Populations naturally increase in size at rates that are determined by the species' biology (number of offspring each birth, number of births per year, age at which females can first become pregnant), the numbers of reproductive females in the population. This rate is modified by environmental factors (e.g. carrying capacity of the habitat, droughts leading to lower survival rates and fewer births), predation, offspring survival and sex ratio.

The theoretical growth rate for any particular species is estimated from observations and theory (such as the relationship with body size). This is used to set a baseline "maximum sustainable growth rate" (known as "rmax"). The actual growth rate can be established for any particular population by monitoring trends in size, and numbers of births and mortalities.

Rate of increase is not a constant, however, and tends to decrease as population size increases. The best yields are obtained at intermediate population sizes – when the rate of increase is high, the population is too small to permit a large off-take; when the population is large, and the rate of increase is too small to give a big yield.
Thus if the population is increasing at a theoretical rate of 10% *per annum*, then if 10% of them are removed, they will be replaced and the overall number will not decrease. However, monitoring may show for a particular area or period of time, that there are lower birth rates or higher mortality than anticipated. A 10% off-take in this case would be too much and would need to be reduced to ensure the population can continue to be harvested in the future.
Notice that a percentage of the population is used to calculate the number that can be removed. Fig. 1 shows off-takes from a population that increases naturally at about 15% per year when there are around 5,000 animals (and with rmax= 30% *per annum*).

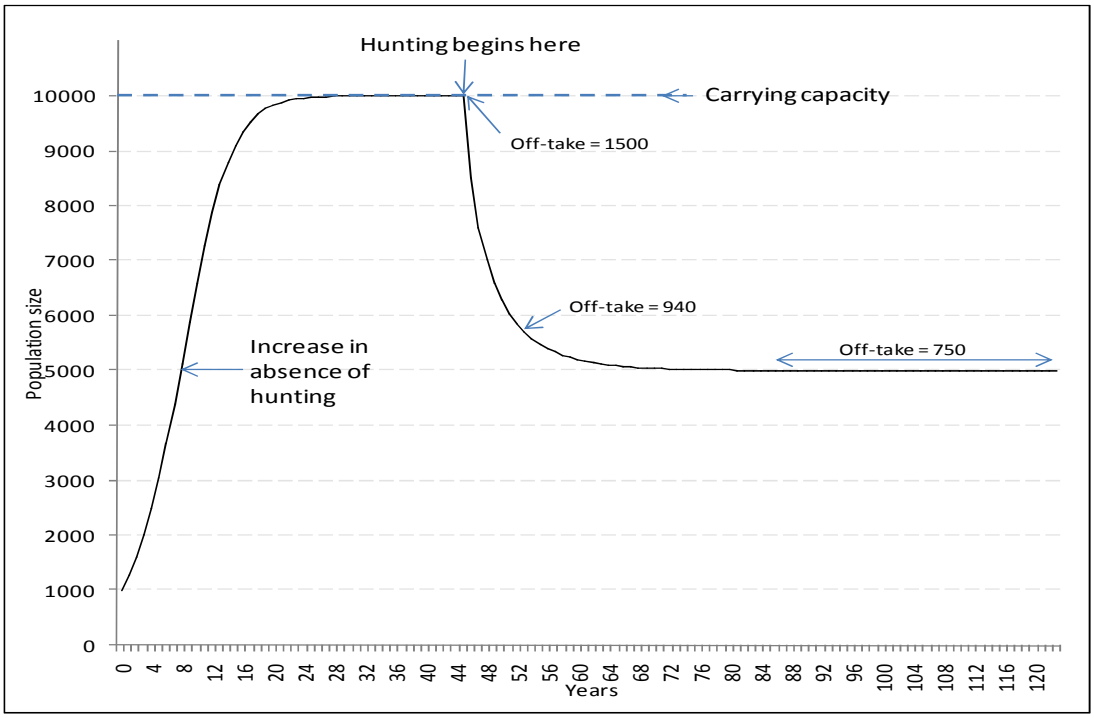


Figure 1 Population changes using a 15% off-take

It is important to use a percentage – using a fixed number every year will lead to the extinction of the population. For instance, in the example in Fig. 2, the maximum sustainable yield is 750 animals *per annum*. However, if a fixed number of 760 is removed every year, the population will go extinct. Note that hunting reduces the population to below its carrying capacity. The population that produces the maximum in terms of off-take is approximately half of the maximum population that the environment will support (rmax/2).

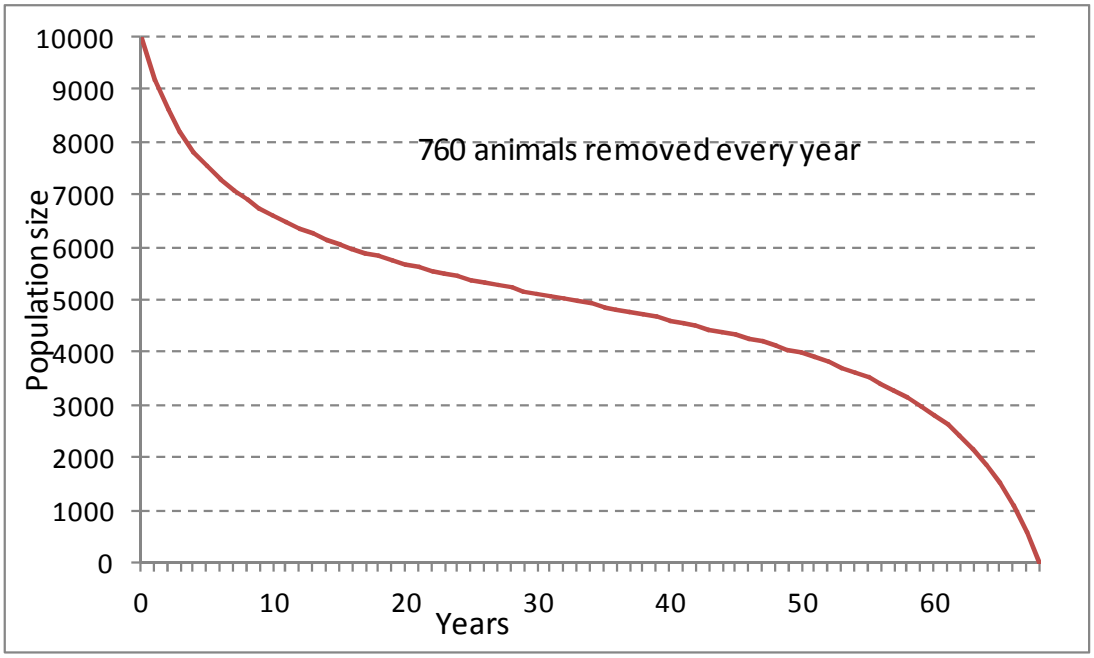


Figure 2 Impact of fixed off-take leading to extinction

To understand how off-take affects a population (and thus to know how to maximise off-takes), imagine a population of 1,000 springbok. The maximum growth rate (rmax) is (for the purposes of this exercise) 30% *per annum*. For the first 45 years, our population is not hunted and is allowed to increase. When it reaches carrying capacity (the number limited by environmental factors), the population stops increasing and maintains itself at 10,000 animals.

Hunting starts in the 46th year. In this example, off-take rates are 33%, 50% and 67% of the maximum growth rate. Fig. 3 shows the population growing exponentially at 30%. Half-way to carrying capacity, the increase is at its maximum and thus half of the growth rate will give the biggest overall off-take. After a few years (in this case about 20 years), both the number of animals in the population and the number of animals that can be removed stabilize. Both smaller and larger percentages produce smaller total off-takes with the population stabilizing at higher or lower levels.

It is not necessary to wait until the population is at carrying capacity before hunting can start – this is done in the example to show that the hunted population stabilizes below this level. The population will stabilize regardless of the starting population if a fixed percentage is taken off.

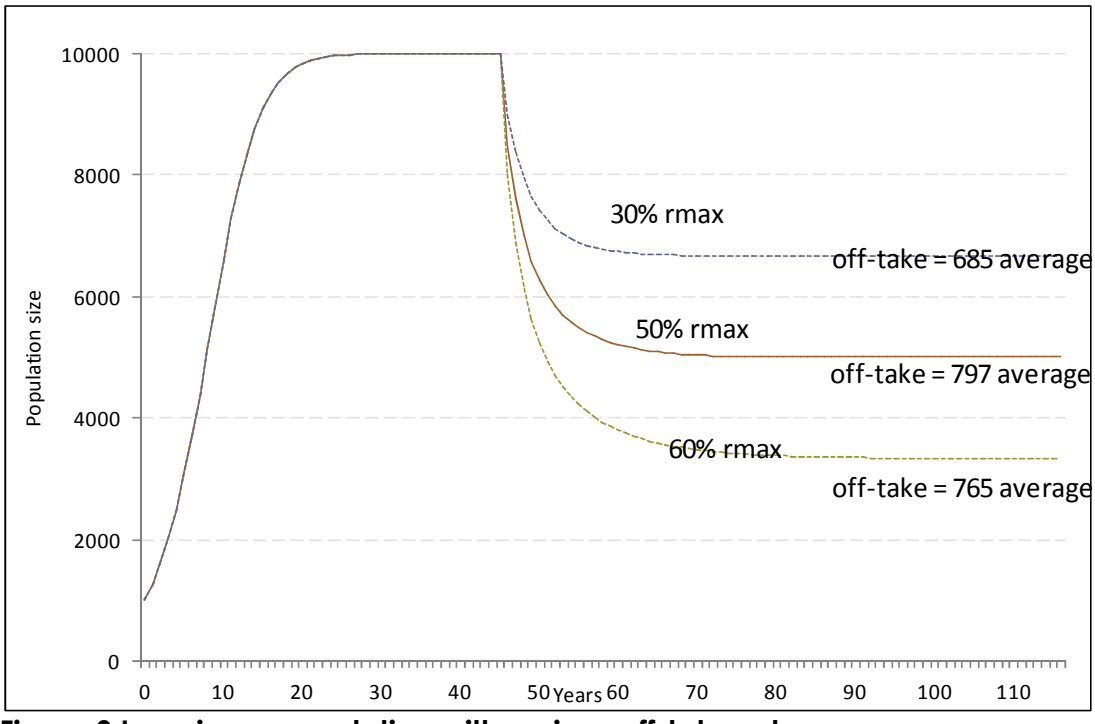


Figure 3 Imaginary population with various off-take rates

In reality, rainfall variation and other factors will cause fluctuations in the numbers of animals that can be removed. Regular population monitoring is necessary to ensure sustainability of harvesting.

Trophy hunting quotas

A trophy hunting quota is much smaller than a harvesting quota because it targets a small proportion of the population that because of the age classes of the are being shot and the shape age frequency distribution (Fig 4). It is in the older age classes containing few animals that the desirable trophies are found.

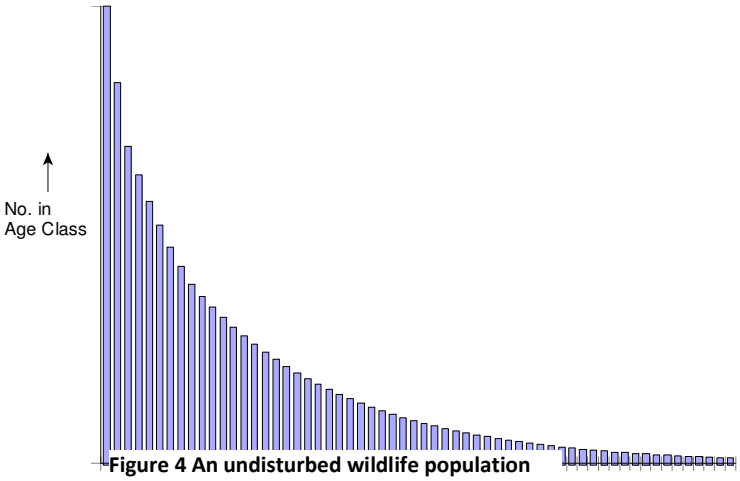


Figure 4 An undisturbed wildlife population

When trophy hunting takes place according to a quota, the age distribution becomes truncated (cut off) as the older, larger animals are shot out (Fig. 5).

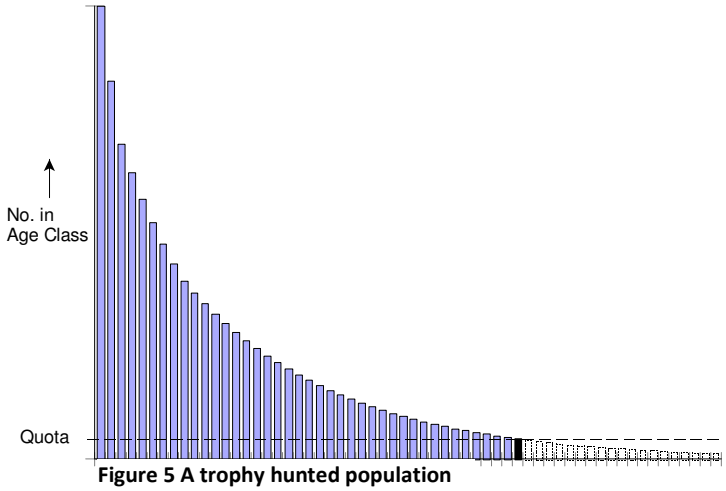


Figure 5 A trophy hunted population

Eventually, the mean trophy size corresponds approximately to the size of the age class which contains the same number of animals as the quota. If the quota is doubled (Fig. 6), the mean trophy age will eventually settle down around the age class which contains twice the number of animals as previously and which contains much younger animals. However the average trophy size will be smaller and at some level this will be unacceptable to trophy hunters.

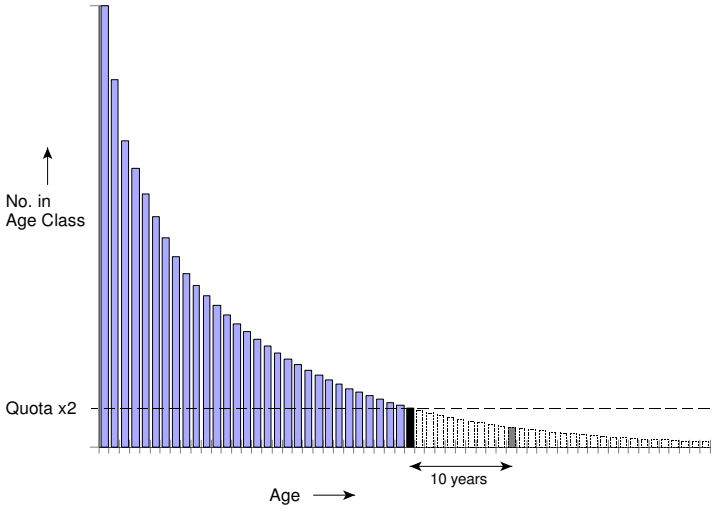


Figure 6 A younger trophy hunted population

From this it can be seen that where there has been excessive trophy hunting in the past, there will be fewer good trophies and it may be necessary to reduce the quota to allow animals to live longer and have better trophies. This may take a long time. If no hunting is carried out, it will take 10 years to restore the trophy size of the population in Fig. 6 to that of Fig. 5 (example based on elephants).

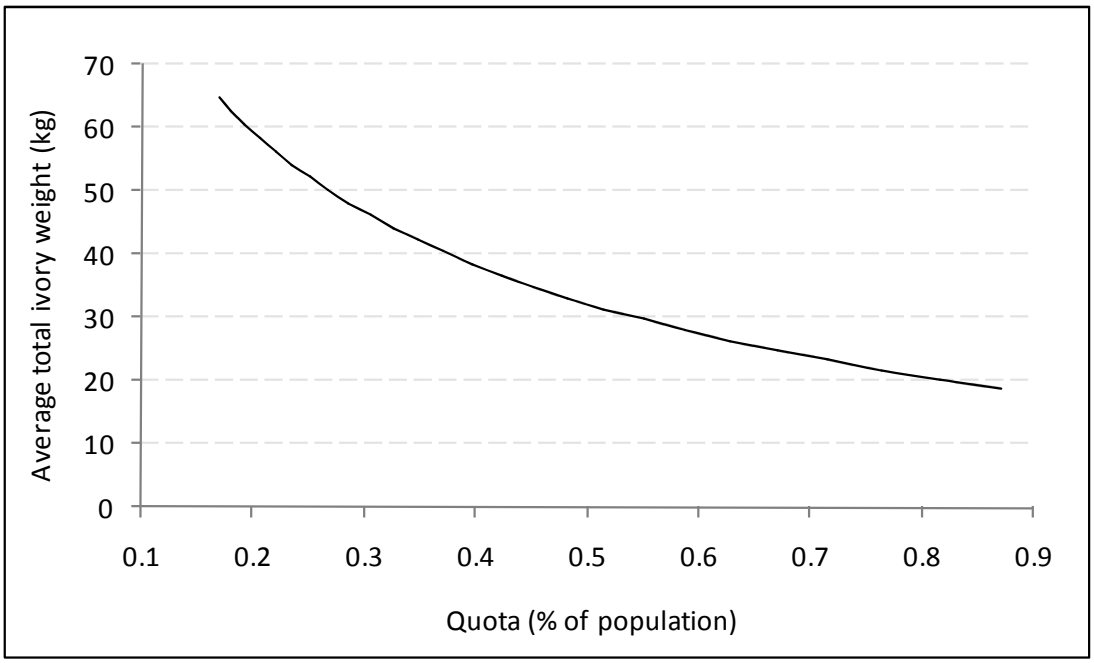


Figure 7 An example to show the decline in tusk size as quotas are increased

The average trophy size of bull elephants declines to an unacceptable level if the quota exceeds a half of one percent (Fig. 7) of the elephant population (i.e. a quota of 5 from a population of 1000 elephants may be too many).

HOW IS A QUOTA CALCULATED?

A quota is calculated by multiplying the number of animals in the population by the off-take rate.

To be able to do this, it is necessary to get information on the number of animals, population trends, birth and mortality rates, maximum sustainable growth rate for the species, trophy quality, past quotas.

However, this is simplistic and in reality should be worked out by observing the population or using a percentage of the theoretical maximum sustainable growth rate (rmax).

Bigger animals do not breed as fast as smaller animals and therefore require lower off-take rates. The following table shows estimated population growth and percentage of a population that comprises trophy animals in Namibian conservancies BUT this **guide only** as depends upon a number of factors including utilisation history, age of population (important for translocated species) etc.

Species	**% Population growth**	**% Trophy animals**
Giraffe	12	2.5
Eland	20	10
Roan	20	5
Sable	20	5
Hartmann's zebra	20	10
Burchell's zebra	25	10
Blue wildebeest	25	5

Kudu	20	5
Oryx	20	10
Hartebeest	20	7.5
Waterbuck	20	5
Black-faced impala	35	10
Common impala	35	10
Tsessebe	20	5
Springbok	40	10
Warthog	50	5
Ostrich	40	10
Duiker	30	10
Steenbok	30	10
Damara dik-dik	30	10
Klipspringer	30	10

QUOTA SETTING RULES

There are a number of rules that must be obeyed when setting quotas:

- take into account the previous quotas and whether they were achieved
- consider quotas in relation to population numbers and trends
- consider the management objectives for each species (i.e. whether the population should be allowed to increase, maintained at the current size, or reduced)
- use all available information about wildlife populations, including local knowledge
- target populations must be viable
- base quotas on transparent and defendable assumptions
- set fairly stable quotas to facilitate marketing but remain adaptable to allow response to changes in wildlife populations and circumstances
- encourage the participation of all stakeholders in the quota-setting process
- MET has the overall responsibility of ensuring reasonable quotas but setting them is up to individual conservancies
- take neighbouring conservancies into account where the populations move between conservancies and share quota benefits based on the proportions contributed by each to maintaining that population
- if there's a danger of mass mortalities occurring, increase quotas
- reduce quotas of trophy animals if trophy quality declines to unacceptable levels
- create non-hunting wildlife breeding zones to encourage animals to remain in the conservancy
- **MONITOR** (population trends, trophy quality, hunting effort)

QUOTA-SETTING ACTIONS IN CONSERVANCIES

There are basically four steps involved in setting quotas in conservancies.

1. Gather all available information on wildlife population sizes, trends, trophy quality, previous quotas, hunting success and theoretical sustainable quotas to calculate "suggested quotas"
2. Hold a meeting with all stakeholders to consider the suggested quotas
3. Agree on appropriate quotas
4. Submit these "requested" quotas to government for final review and approval

Should there be inadequate information to be able to set responsible quotas, it is necessary to apply the "precautionary principle". This means you should be conservative when setting quotas if you don't have good information. For instance, if there is uncertainty about the size of the population, work on the lowest likely number.

An important on-going activity is the maintenance of a good monitoring system so that the impacts of the off-takes can be evaluated and subsequent quotas adjusted appropriately.

QUOTA-SETTING IMPACTS

Quotas must never be exceeded and all types of off-take must be very carefully controlled. Some types of off-take can be extremely damaging to wildlife populations or to the conservancies themselves.

OFF-TAKE TYPE		**OUTCOME**
Live capture for sale	Takes large proportion of females	Population size can't recover if repeated too often
Own-use hunting	Takes females and young males	Population decline; reduction in future trophy size
Trophy hunting	Takes males;	Population decline for species with special social structure/behavior (lions, hyaenas). Little negative impact for other species
All off-take types if unethically/unprofessionally conducted		Tourists upset by wounded animals; Namibian & conservancy reputation damaged
All off-take types if quotas exceeded or quotas too high		Decline in trophy quality, increased hunting effort, decreased wildlife populations for tourism
Harvesting		Remaining animals leave the area

Handout 8

WATER MANAGEMENT PLAN

for

NYAE NYAE

G.C. Stuart-Hill
Stuart-Hill & Associates

November 1997

INTRODUCTION

This document represents the operational plan for implementing improved game water in the Nyae Nyae Conservancy. It begins by quoting the strategic objectives from the Conservancy's Management Plan and continues with a detailed description of major tasks that need to be completed. The latter is in the format of a time bound project-planning sheet with attached reference notes for each step.

OVERVIEW OF THE WATER MANAGEMENT PLAN

Because of the lack of basic information (inventory of existing boreholes and lack of hydrological/ ground water knowledge), the water plan will need to be developed over a number of years. A first step in this direction is contained in the map produced for the Management plan of October 1997) (Appendix 1). Areas of intensive human usage were firstly excluded for possible sites for game water points and this immediately highlighted two problematic existing game water points (Djokhoe and Gimsa) which fell within the human priority areas. The areas outside these zones were seen as having the potential for being priority game areas and where game water points could, therefore, be established. However, there needs to be a strong cautionary note that many areas are spoken for by various members of the community and this aspect will need to be revisited once likely sites have been identified. The next step was to identify existing boreholes which could be equipped so that a reasonable spread of dry season water could be effected with the minimum of cost. Unfortunately, there are not many such bore holes and this forced the situation where a number of new bore holes will need to be drilled and equipped in order to achieve a spread of dry season water points at approx. 20km intervals. It also became apparent that the northern and southern areas of the conservancy are not well connected from a game water perspective and this will continue to place dry season pressure on north-south game movements within the Conservancy. An added cause for concern is the number of human settlements within the zone (along

the road) whose water would be targets for game moving through the area. Consequently, it will be necessary to find water and provide game water in the 'middle zone of the conservancy.

Developing the full water plan will be costly and exhaustive. Consequently, this will be done in three phases, the first of which will begin in summer of 1997.

- **Phase I** will focus in the area south of the main road (central and east) and after consolation with local MET representatives, the NNFC have decided to close two existing game water points (Djokhoe and Gimsa) which for many years have been the source of community-wildlife conflict. However, this will be done responsibly and will involve: i) firstly establishing five new permanent game water points, ii) allowing these to be discovered by game, and then iii) closing the problematic water points. The NNFC is ready for conflict during that time and will take the necessary short term action (protecting pumping equipment, 'thunder-flashes, etc.) but would rather endure a short term problem than an ongoing one. A solution to this problem is important because unresolved, it will break down community support for the game re-establishment initiative.
- **Phase II** will focus in the North aiming to link Nyae Nyae with Khaudom Game Reserve and ensuring that there is a supply of water linking the northern and southern areas of the conservancy.
- **Phase III** will focus in the South-West with the aim of opening up that area as a dry season game area and to intervene in any areas where the previous two Phases have shortcomings.

The NNFC will employ a hydrologist to evaluate the area as a whole in terms of the sustainability of bore holes generally in the conservancy (including villages) as well as indicating areas where ground water is likely to be found (necessary for improved planning of the second and third Phases).

The NNFC will arrange a high level meeting with MET (and possibly water affairs) to clearly establish the principles and procedures for the maintenance of these water points. An option that will be put to MET would be to contract the conservancy to maintain the game water points on behalf of MET. In this context, the NNFC will train its staff and seek to standardise on pumping equipment to ensure adequate spares and reliable servicing.

The NNFC have decided that tourists will not be allowed to camp next to permanent game water holes, exceptions being where a concessionaire builds their own water point as part of a tourist attraction. The NNFC would consider allowing the establishment of discrete camping sites next to large seasonal pans but this would need to be accompanied by an EIA focusing on the potential negative impact on water birds. The NNFC will not permit any hunting within 2 km of any permanent game water hole.

OPERATIONAL GUIDELINES
(Broadly repeated for each Phase)

Implementation of each Phase of the water plan will involve a number of steps (please refer to the attached project planning sheet). The following text is a brief description of each task which is cross referenced with the project planning sheet via a unique ID number.

1. **Obtain background information.**

a) Request MET for their opinion of a water distribution plan using resources with local knowledge but with the constraint that human settlements will not be moved. This should apply to the entire Nyae Nyae area with comments relating to existing and planned water sources in Khaudom and western Bushmanland.

b) Conduct a full field inventory of all existing water sources and from this determine the feasibility, physical requirements and plan of action for equipping bore holes in the areas identified on the water plan map. This should be repeated for each phase.

c) Contract a hydrologist/water diviner (Dept of water affairs) to investigate siting of new bore holes in areas identified in the water plan map. Care should be taken to ensure that the area where water is to be presented to game is attractive and that a cheap structure can be built (e.g. existing natural pan, areas where clay lining is available, solid foundation for concrete basis without excessive reinforcing required, etc.). This should be repeated for each phase. When first contracting the hydrologist, he/she should <u>also</u> be asked to evaluate the area as a whole in terms of the sustainability of bore holes generally in the conservancy (including villages) as well as indicating areas where ground water is likely to be found (necessary for improved planning of the second and third Phases).

2. **Develop Water Implementation Plan**

a) Design draft water plan for EIA. This will be based on modifications necessarily made to the existing rough water plan (October 1997) as a result of activities 1 to 4. This is necessary so that the ecologist conducting the EIA has something on which to base an evaluation.

b) It would be wise to consult with a person having both practical and technical knowledge regarding bore hole equipment in similar areas (and with elephants). The brief should be to advise on the relevant advantages of solar and wind mills (taking into account the expected wind speeds during the critical months). Importantly, the person would also advise on the maintenance aspects in terms of equipment standardisation, spares and servicing in remote areas.

c) Conduct an EIA (February 1998) on the proposed water points. This should include impacts on the human issue of bore hole/area user rights as well as the bio-physical impacts. Special comment should

be made on the necessity of establishing artificial game water points given the near closed nature of the ecosystem and the desire to increase the numbers of all species of game in the area. The ecologist would be expected to suggest modifications to the water plan, if necessary.

d) Compile a comprehensive implementation plan by incorporating the recommendations resulting from steps 5 to 8 and with a consideration of available budgets. This plan would be presented to the NNFC Board for final approval and consequently should be as fully inclusive as possible.

e) Present the water implementation plan to the board of the NNFC for a final decision.

f) Make final modifications to the water plan based on the outcome of the Board meeting. This version should detailed all the necessary specifications in order to establish and commission the water plan.

3. Establish the water points

a) Draw up three tender documents to establish and equip the boreholes and to construct the appropriate water holding facilities. It will be essential to ensure that, if the tenders are awarded to different persons, that there is a clause to ensure the contractors' work closely together. A code of expected conduct should be appended to the tender documents with provisions for conventional penalties on miss-conduct or non-delivery.

b) Invite respectable contractors to submit tenders/quotes on drilling new boreholes.

c) Invite respectable contractors to submit tenders/quotes on equipping the existing and new boreholes.

d) Invite respectable contractors to submit tenders/quotes on constructing structures into which the water will be pumped.

e) Award tenders based on criterion specified by the NNFC.

f) Contractor to drill new bore holes where specified (in step 4) and thereafter conducts the usual delivery/quality tests. Equipping the borehole (step 19) should not proceed if water delivery/quality is not adequate. Budgets permitting, alternative sites in the area should be drilled and consequently, it is recommended that a budgetary contingency be made for failures.

g) Contractor to equip the new and existing boreholes according to the specifications in the tender documents. Proper measures to ensure that the pumping equipment is not damaged by elephant should be made (this could form part of the tasks required of the contractor responsible for step 20). Some percentage of payment should be retained for three to four months after installation to ensure that all the equipment works. This work should begin on the existing

boreholes which simply need equipping so can begin immediately following step 17.

h) Contractor to construct appropriate water holding facilities in the form of either concrete/clay lined pans (on porous soils), scoops (in natural clays) or natural depressions into which the water will be pumped and made available to animals. Again, some payment should be retained for a few months after installation to ensure that facilities do not leak unduly and are robust enough to withstand the attentions of elephant. This work should begin on the existing boreholes and so can start immediately following awarding of contracts (step 17).

i) Commission water holes. There should be some formal handover of the game water points from the contractors to the NNFC. 'Snag lists' should be drawn up prior to this and all problems ironed out before the NNFC takes them over and payment of contractors is authorised.

4. Bore hole maintenance plan

a) Arrange a high level meeting with MET (and possibly water affairs) to clearly establish the principles and procedures for the maintenance of these and other water points which the NNFC will be responsible for. The NNFC to explore with the Government authorities, the possibility of the NNFC being paid to maintain these assets as this will fulfil the Governments responsibility (given their shortage of manpower) and at the same time provide employment to local people.

b) Depending on the outcome of step 23, develop a bore hole maintenance plan for each bore hole ensuring that there is clear accountability for each water point.

c) Present the Maintenance plan to the NNFC Board for approval and necessary modification.

d) With the assistance of the Board, assign responsible persons to each game water point (this could be a 'bore hole attendant' from the nearest village or the community ranger responsible for the area.

e) Arrange and provide the necessary training for these borehole attendants.

f) Arrange and provide the necessary training for a mobile maintenance team which will be called in to repair equipment when major problems arise.

g) Maintenance team can start early on existing game water points which will give them an opportunity to slowly accept responsibility for

5. Closure of Village Water Points

a) The existing water points known as Djokhoe and Gimsa will be closed, as they have for many years been the source of community-wildlife conflict. However, this will be done responsibly and in

addition to establishing alternative game water points, will involve the following three steps.

b) Monitor game activity around each new water point to establish when these become fully utilized by game.

c) Take extra precautions by protecting pumping equipment, erecting a temporary electric fence around the village, etc. at the water points to be closed

Handout 9

HUMAN-WILDLIFE CONFLICT

BACKGROUND DOCUMENT

INTRODUCTION

Human-wildlife conflict (HWC) is a world-wide problem from mice raiding barns in South America, tigers killing cattle in Asia to elephants in Africa raiding crops and damaging water supplies. As human populations increase and natural habitats shrink, people and wild animals increasingly come into conflict over food and other resources. Humans lose their livelihoods – crops, livestock, property and even their lives sometimes; they waste time, effort and money in attempts to prevent conflict with wildlife and their experiences often result in a reduced support for conservation. Animals are often killed as "problem animals" to prevent future conflicts or in retaliation and reactions to HWC can threaten survival of many species in different parts of the world.

HWC varies in different areas, even within an area, depending on the species involved, the density of human populations and the livelihood activities of the people trying to live with wildlife. Because of these differences, people in each area need to choose their own strategies for managing HWC. For some species, such as elephant that become used to the methods used against them, it is necessary to use a succession of different methods. In some areas the provision of water specifically for wildlife may keep the animals away from human habitation.
In Namibia, there has always been (and always will be) HWC where people live with wildlife. To provide some guidance for managing HWC, the Ministry of Environment and Tourism (MET) developed a "National Policy on Human-Wildlife Conflict Management" which outlines a number of options for managing or mitigating the problem and this is supported by a document which offers guidelines for implementation. Conservancy managers, staff, game guards and committees should be thoroughly familiar with these.

THE NATIONAL POLICY ON HUMAN-WILDLIFE CONFLICT MANAGEMENT

The National Policy recognises the need to promote wildlife conservation while acknowledging the rights and development aspirations of communities in rural areas. The Government encourages self-reliance and expects people and organisations to not only make decisions regarding HWC but also to manage HWC themselves. The Government also expects the costs caused by HWC to be paid from part of the income from wildlife utilisation and will not pay any compensation for damage or losses caused by wildlife. However, the Government acknowledges that there may not be the required skills in affected communities and will build capacity for people to deal with HWC management in rural areas.

The policy largely addresses agricultural development projects, but there are a number of important strategies that are fundamental to avoiding or reducing HWC:

- Crops should not be grown in areas where wild herbivores are likely to damage them unless it is practical to protect them. People should, within their capacity to do so, take responsibility for protecting their crops and livestock from the impacts of wild animals
- MET will help to implement avoidance or mitigation measures against HWC even though responsibility to do this lies with the communities
- HWC management should be guided by plans forming part of wildlife management and utilisation plans
- Good land-use planning and zonation should be developed to reduce or halt the overlap of wildlife and human activities. This can include the establishment of wildlife corridors and exclusive wildlife areas
- Those CBNRM activities that maximise benefits to people most affected by HWC should be promoted and supported by MET
- Where it is appropriate to destroy a problem animal, designated regional MET staff will be given the authority, according to clear guidelines, to allow designated, trained community members to destroy the animal (in the past approval to destroy a problem animal had to be given by the PS or Minister)

CONSERVATION CONSIDERATIONS

PROBLEM ANIMALS

Problem animals are those that repeatedly kill livestock, raid crops or harass people. Other individual animals may cause occasional problems opportunistically but not habitually. Species that are commonly involved in HWC vary from region to region and their impacts are similarly variable. The following table shows some of the animals known to conflict with human interests.

Table 1. Problem animal species and their impacts

Species	**Crop damage**	**Livestock death**	**Stored food damage**	**Water supplies**	**Property damage**	**Human injury/disease**	**Human death**	**Fear & disturbance**
Elephant	√	√	√	√	√	√	√	√
Buffalo	√					√	√	
Mountain zebra	√							
Hippo	√					√	√	
Rodents	√		√			√		
Bushpig	√							
insects	√		√			√		
Birds	√		√					
Crocodile		√				√	√	√
Lion		√				√	√	√
Spotted hyaena		√				√		√

Leopard		√				√		
Jackal		√						
Caracal		√						
Cheetah		√						
Wild dog		√						

MITIGATION OF HWC

There are numerous options for dealing with problem animals. Few are effective on their own as many animals become used to them and ignore them. It is common to apply a succession of those different methods that are financially, legally or practically possible for the community to use.

The use of chilli pepper (*Capsicum*) has become widespread in attempts to mitigate human-elephant conflict. In different forms it can be effective and practical to use. It has an added advantage that the production of crops of peppers can provide an additional source of income.

CROP & WATER INSTALLATION PROTECTION

Options for protecting crops & water points include:

- *Traditional methods* such as fires, banging drums, cracking whips and shouting become ineffective as elephants get used to them and realize they won't harm them

- *Electric fences* – expensive but very effective; difficult to use in a communal setting because of a lack of ownership leading to a reluctance to maintain them

- *Stone walls* – effective barriers to elephants if they are high and thick enough. They need to be far enough from the water point being protected to prevent elephants from leaning over and reaching the installation

- *Paving with sharp rocks* around water installations – effective barrier to elephants if it extends far enough to prevent elephants reaching the installation. The stones need to be close enough together to prevent elephants from stepping between them and must be fixed in concrete

- *Trenches & moats* – effective barriers to elephants as long as they are well maintained and deep. Elephants must be prevented from pushing sand into a trench to breach the defense.

- *Provision of clean water*– elephants damage water installations in frustration or in search of clean water; where it is available they will drink and move on without causing problems

- *Separate water points for wildlife* – reduce competition for water with livestock and separate wild animals from human settlement

- *Chilli pepper fences* – chilli mixed with old oil is smeared on rope fences

- *Chilli pepper sprays* – developed from sprays to deter bears and muggers in the USA, these are effective but difficult to use safely (and furthermore can irritate the mucous membranes of people downwind of them)

- *Chilli pepper bombs* – chilli mixed with elephant dung produce a noxious smoke that deters elephants (but with the same impacts on people downwind)

- *Guards* – effective in scaring elephants away but can be dangerous (elephants become so used to people they may chase them away before crop-raiding). Simple alarm systems can be made to warn the guards so that they don't have to stay awake all night

- *Killing* – popular with affected people because of a feeling that this is retribution for the problems caused and has the added advantage that it provides free meat. It seldom has any long-term effect; the "problem animal" may be replaced by another or the wrong animal has been killed.

- *Capture & translocation* – very popular with animal welfare people. This is a very expensive option for elephants and is can simple be moving the problem from one area to another

- *Zonation* – good land-use planning can reduce HWC considerably by separating wildlife from human activities. Fields and gardens should not be near protected area boundaries or known elephant or hippo paths; human settlement and fields should be consolidated so that protection can be shared; corridors for wildlife can be kept clear of crops; water can be provided specifically for wildlife away from settlements and so on

LIVESTOCK PROTECTION

Livestock (particularly cattle) are important source of income, status and food for many rural people in Namibia. Predation by carnivores is understandably of considerable concern to farmers in rural areas.

Options for protecting livestock include:

- *Killing* – popular with affected people because of a feeling that this is retribution for the problems caused. For lions and hyenas the disruption of the social structure of their group by the removal of a dominant animal (pride male lion; dominant female hyena) can have significant impact on their behavior and ultimately population survival.

The removal of adult jackals leads to their replacement by immature animals that are inexperienced hunters. This can lead to an increase in predation of young small stock that are easy to hunt.

- *Capture & translocation* – very popular with animal welfare people. . It is likely that this option is not, however, as humane as it would first appear – animals may be relocated into other animals' territories, they may not be able to easily find water and food, at first and for social animals that do not hunt alone, it is unlikely that they will survive in a new area. This option has the added disadvantage that the new location must be a significant distance from the original home range as many animals will simply return to where they originated. The same concerns about impacts on populations apply as for killing problem animals

- In some places, livestock in kraals at waterpoints have been killed by elephants. This sort of incident can be avoided by making sure that cattle kraals are not too close to water points and by providing separate water for elephants

- *Herd livestock* – the presence of a herder can deter predators. Traditionally children were used as herders but most children now go to school and are not available to look after the livestock. An alternative is for farmers to pay people to look after their animals

- *Kraal livestock at night* – predator-proof kraals are effective in preventing loss of livestock to carnivores. This may be difficult for nomadic communities if they need to build new kraals often as they move

- *Dogs* – are good deterrents to cheetahs and, to a lesser extent, leopards. Namibian breeds brought up from puppyhood with the flocks they are to protect are suitable animals. Anatolian sheep dogs are not adapted to Namibian climate and suffer in the heat and have a tendency to develop cancer from exposure to the sun.

- *Female donkeys* – brought up with cattle defend "their" herd fiercely from leopards

- *Wire fences* – at watering points prevent livestock and people from crocodile attacks. They cannot be used when rivers are in flood.

- *Self-reliance schemes* – being developed in Namibia. Conservancies use diverse funds, often generated from conservancy enterprises (wildlife utilisation; joint venture tourism etc), to fund the scheme to help those people in the conservancy who suffer most from HWC. People applying for assistance have to show that they have implemented preventative measure to the best of their ability or resources. Payments are made for the loss of livestock to wild predators and for crops lost from elephant and hippo damage. No payments are made for livestock killed in an exclusive wildlife zone.

The following table summarises the options available for reducing or reacting to HWC and includes a rough comparison between them all.

Table 2. Options for mitigating HWC

OPTION FOR MITIGATION	***SPECIES on which option used***	***EFFECTIVENESS***	***ADVANTAGES***	***DISADVANTAGES***
Guards / scarecrows	Elephant, buffalo, hippo, bushpig, birds	Short-term	Inexpensive, not fatal to animal	Dangerous with some species
Noise	Elephant, antelope,	Short-term	Inexpensive, not fatal to animal	Animals become familiar & ignore
Fires	Elephant, lion, hyaena	Short-term	Inexpensive, not fatal to animal	Mostly ineffective
Stones, spears	Elephant, hippo, buffalo	Short-term	Inexpensive	Dangerous if animal wounded
Alternative water supplies	elephant	Long-term	No harm to animal; attracts other species	Doesn't stop crop-raiding
Firing weapons near animal	elephant	Short-term	Relatively inexpensive, not fatal to animal	Can be dangerous
Flares, lights, flashes near animal	elephant	Short-term	Relatively inexpensive, not fatal to animal	Animals become habituated
Chase with aircraft, vehicles, people	elephant	Short-term		Expensive, dangerous
Kill problem animal	all	Short-term	Popular; relatively cheap	Needs trained people; dangerous; wrong animal may be killed; may not affect other problem animals; may impact on population (especially lions, hyaenas)
Decrease population (cull)	Elephant	Short-term	May provide meat & other products	Needs trained people; dangerous;
Remove entire population	elephant	Long-term	No more problem	Loss of potential revenue from wildlife; can threaten species; can be internationally

				unacceptable
Electric fencing round items to be protected	Elephant, antelope, buffalo, hippo, larger carnivores	Long-term	Defines boundary; not fatal to animal	Expensive, requires maintenance; vulnerable to theft;
Electric fencing PA boundary	Elephant, buffalo, large carnivores	Long-term	Not fatal to animal	As above; reduces CBNRM opportunities
Stone walls / sharp stone paving	Elephant	Long-term	Relatively inexpensive; not fatal to animal	Maintenance required
Moats, trenches	Elephant	Short-term	Relatively inexpensive; not fatal to large animals	Considerable maintenance required
Chilli bombs, sprays	Elephant	Short-term (elephants)	Home-made sprays possible; not fatal to animal	Dangerous if need to get close to animal
Chilli-grease on barriers	Elephant	Long-term (elephants)	Relatively inexpensive; income from chilli crop; not fatal to animal	Requires regular refreshing
Live capture/translocation of individual problem animal	Elephant, lion, leopard, cheetah, wild dog	Short-term	Not likely to be fatal to animal	Moves problem to another area; other individuals remain may cause problems; animal may return to original site; wrong individual may be identified; very expensive; requires expertise; may impact population structure
Self-reliance (from CRNRM benefits)	Species designated by community	Long-term	Encourages good farming practices; compensates deserving cases	Requires good governance and financial management; may improve tolerance towards wildlife; compensation may not be market related
Employment of	Lions, leopards,	Long-term	Gives employment to	Inappropriate for nomadic

herders; keeping animals in secure kraals at night; using dogs	cheetah, caracal, hyaena, jackal, wild dog,		community members	people; the traditional use of children as herders not possible due to schooling
Manipulate breeding times; keep young animals close to habitation	Lions, leopards, cheetah, caracal, hyena, jackal, wild dog	Long-term	No extra costs	Requires more complex stock management; assume grazing available in required areas
Construct fences in rivers at sites used by livestock & people	Crocodile	Long-term	Does not prevent other animals accessing the water	Only seasonally useable because of flooding

Handout 10

The Event Book System in Namibia

Greg Stuart-Hill & David Ward

on behalf of the Natural Resource Working Group

WWF in Namibia PO Box 9681, Windhoek, Namibia: gstuart@ww.na

Introduction

Namibian legislation allows communities to benefit from wildlife on condition that they actively care and manage it. The basis of wildlife management requires an understanding of what is going on and so Conservancies need a monitoring system to get this information.

Initial Conservancy monitoring systems in Namibia were conventional in that experts (scientists) designed them, conservancy employed staff collected the data and then handed in data sheets which were analysed by the experts. Communities rarely received feedback, there were lengthy delays, or community members simply were not able to understand results. This meant that the community had no ownership nor interest in the monitoring process and, like in so many places acrsss the world, these early systems struggled to survive.

In 2000, a more effective monitoring system emerged. Known as the "Event Book", it is designed primarily around meeting the needs of the local community. Its name derives from monitoring events that occur randomly e.g. fire, poaching, human-wildlife conflict, mortalities, etc. However, it also makes provision for systematic monitoring activities such as vegetation or wildlife censuses.

In summary: the "Event Book" differs from traditional monitoring in that: (i) the community decides on what they want to monitor, (ii) technicians only facilitate the design process; and (iii) analysis is undertaken by conservancy members.

But what is the Event Book System?

The Event Book is a personalised A5 ring file maintained by each community ranger. The file contains a diary and set of yellow cards - one card for each monitoring theme or topic. There is a card for poaching, a card for human-wildlife conflict, a card for rainfall and so on. As events occur, rangers select the appropriate card and record the event. At the end of the month a line is left bland and the same card used in the ensuing months. At the end of the year, all of the old cards are removed, archived and a fresh set of cards inserted into the book.

Data analysis and reporting is done locally. Critically, the people collecting the data also analyze and interpret it. This principle emerged following failures with the conventional system (where data were analyzed by an expert).

For each monitoring topic there is a complete modularized kit that begins with a data collection card, a monthly reporting chart and finally a long-term reporting chart (Figure 1). Colour coding is used to avoid confusion between these data-flow levels (yellow for data collection; blue for reporting within a year; and red/pink for tracking changes over years).

INSERT FIGURE 1 – an example of one module - poaching

In all cases the community decides on what they want to monitor, but in terms of the legislation, Conservancies are obligated to report on levels of wildlife utilization and so this is automatically included. Agreement on what to monitor is reached through a workshop involving community leaders and rangers. This starts with brainstorming all issues of importance and ends with a list of topics that should be monitored. To make the final selection of topics clear a 'job description poster' is constructed (Figure 2). Also known as a mind map, it contains pictures and icons to assist less literate community members.

INSERT FIGURE 2 – Mind map

Most Conservancies now days generate sufficient income from tourism and wildlife utilization to employ staff to do this work. Conservancies who do not yet have sufficient own income use community volunteers.

How does the Event Book work?

To support local design and ownership, yet still provide scientific integrity, the system has been modularized by topic. Twenty-one modules, covering a range of issues, have been developed thus far.

Modules Developed:

Problem animal incidents; Poaching; Predator encounters; Rare and endangered animals; Fence monitoring; Water point monitoring; Flooding and river levels (for those conservancies that are in flood plains); Rainfall; Wildlife sighting during fixed foot patrols; Wildlife mortalities; Trophy hunting; Wildlife harvesting; Livestock mortality; Livestock theft; Livestock condition; Fishing effort; Fish catch trend; Long-term vegetation change; Seasonal grass grazing assessment; Craft resources; Wildlife re-introductions.

These modules represent a shopping list of potential topics that a community could monitor. Once the conservancy selects what it wants to monitor, the technical support team develops a kit containing all the modules that they selected. Each kit contains the colour coded 'tools' necessary for data collection, and reporting monthly and over years. The kit is updated at the end of each year and costs only about US$10 per year.

New conservancies normally only start with three or four modules and over time, as needs and skills develop, they add more modules eventually covering a wide spectrum of issues – all at their own pace.

How is data analysis done?

Data analysis is extremely simple. Every month the field rangers collectively complete the monthly (blue) reporting charts (see Fig. 3). These charts are pre-prepared A3 templates that are housed in a large format 'flip-file' so results can be displayed at community meetings.

INSERT FIGURE 3a example of a blue reporting chart

The reporting principle is that one 'block' on the chart refers to one 'event'. To report on poaching for example, one block is coloured for each poaching incident, two incidents = two blocks, and so on. In some instances one block may represent standard values, e.g. 5 mm of rainfall or 10 animals seen whilst on patrol. Some advanced Conservancies also complete reporting maps.

At the end of each year, the totals for the year are transferred onto the long-term reporting charts (red/pink). These are similar to the monthly reporting charts and use the same method of colouring in blocks to represent number of incidents or quantities (Figure 4).

INSERT FIGURE 4 example of a red/pink reporting chart

The essential difference between the 'blue' and 'red' cards is that the x-axis on the latter is years rather than months. Colour coding the different reporting timescales has proved to be critical in avoiding confusion.

These reporting materials are presented at monthly community management meetings (and at annual general community meetings). Community members compare differences between months (blue charts) and or years (red charts) and using their local knowledge reach management decisions through concensus.

INSERT FIGURE 5 - game guard showing 'event book' results

Year-end Auditing, Reporting and Archiving

At the end of each year there is an annual audit of the system which is conducted by external stakeholders (government, donors, NGOs' and/or neighbours).

INSERT FIGURE 6. Photo - Event book audit

It's a tough process with everybody trying to find errors, but its also a time to brush up on skills and to discuss the results. There is also an audit questionnaire. It asks if an particular activity was done. If the answer is 'yes, it was done', then the data are inspected for correctness and if the auditors are satisfied, the summary of results are recorded. The completed questionnaire then constitutes the conservancy's annual monitoring report (see Appendix). The annual audit takes approximately 4 hours. At the end of the audit all the year's data (the yellow cards from each community ranger plus the blue chart) are archieved in the Conservancies 'filing box' and then the system is prepared for the coming year – is installing a new diary and fresh cards in each rangers Event Book and issuing a new pack of blue reporting charts to the senior ranger. Of course the red charts are simply updated with the most recent year's data and so are not replaced each year.

Conservancies have been happy to share their results and take great pride in their annual reports. There is considerable peer pressure between conservancies to have the best Event Book system and in one area of the country there is an extremely active competition between them with prizes being awarded.

Pen & Paper vs Computers?

The entire system is paper-based, which is appropriate for remote communities and avoids the sustainability problems of ever-changing computer technology. All papers are filed in a custom filing box (Figure 7). This simple tool is indispensable as it formalizes the system in an environment where conservancies often have no office. The data are owned by the conservancy and any data extraction is done by copying – i.e. if someone, a researcher or government official, wants data only a copy may be taken away. Original raw data never leaves the community!

INSERT FIGURE 7 an Event book filing box

Visiting researchers, with permission from the Conservancy, can easily capture event book data into digital format for further more sophisticated analysis. In addition summary data from all conservancies is also captured into a national database and used to create a national view of the performance of the CBNRM programme in Namibia.

(Box x below summarises the key elements of the system).

Elements of the Systems

1. **A visual description of the monitoring work to be done**
   i. the 'Monitoring Poster' for the area as a whole
   ii. 'Job Description Posters' for key persons
2. **'Data-Flow' posters**
3. **A data capture system – 'Yellow Data Cards' (e.g. 'Event Books', 'Incident Books', 'Pocket books'; Office Registers')**
4. **A monthly/annual reporting system**
   i. '**Blue** Reporting Charts'
   ii. 'Reporting Maps'
5. **Long-term 'Red Reporting Charts' (for Trend)**
6. **An Annual 'Audit Report'**
7. **An 'Archiving and Filing System'**

Implementation Process

The role of experts (scientists)?

The role of experts is to provide advice on how a community can gather, process and report the information for each monitoring topic that it selects. If a module has already been developed with another conservancy it is made available to a new conservancy.

Of course it is not compulsory that the community use the module but because these are standardized across the country, it simplifies the job of supporting these materials on a sustainable basis. This approach is a win-win solution whereby the community gets to monitor what they want, whilst the supporting technicians work with standardized materials.

Principles

- Communities/managers decide what they need to monitor
- Data collection, analysis and archiving is undertaken locally
- Technical people only support the process

Implementation schedule

Full implementation of the Event Book System takes a number of years because it is implemented incrementally, building on small successes. The community needs at least two years of reporting to experience all levels of the system. This presupposes that the participants have basic skills in map reading, filling in data forms and knowledge of the issues being monitored. Depending on the skills at a given conservancy, average follow-up interventions are every quarter during the first 12 months and every six months thereafter for at least two years. Each intervention is kept short (max one day) to maintain interest.

There are three implementation phases

Implementation Schedule

Phase 1 (>18 months):

- **Design the system**
- **Develop materials for the field**
- **Start YELLOW data collection**
- **Begin BLUE level analysis (i.e. monthly reporting systems).**

This phase can only be completed once a full year/season of data gathering and field analysis has been completed.

Phase 2 (approx 2 years):

- **Continue providing support for the systems established during phase 1**
- **Design and implement RED long-term trend reporting tools**
- **Refine the system as required**

Phase 3 (Optional):

- **Design systems for reporting to external stakeholders (e.g. annual reports)**
- **Design systems to aggregate data from many different conservancies**

Produce reporting templates, develop a computerized information system for data input, processing and reporting. Timing for this phase varies because the databases get increasingly more complex depending on the level from which data are inputted (red, blue or yellow level).

How much detail to collect?

Land managers want 'balanced' monitoring systems - i.e., a bit of information about a lot of things rather than lots of details about one or two components of the system. Scientists tend to get tangled up in detail and encourage data collection based on "what if ….." scenarios. Managers want basic facts – are species declining, is the vegetation is degrading, is poaching increasing? How much data should be collected? "If in doubt, leave it out"!

Need for visual representation of results

The simple reporting charts and maps are critical for success. Primarily for information sharing with community members, they just as importantly serve to motivate the people collecting the data. The charts incidentally also allow managers to track work performance of conservancy employees.

Problems encountered

A number of technical problems were of course encountered. These resulted in a number of rules, which the rangers termed their 'Ten Commandments'. These have become the cornerstone for successful implementation, some of which insidiously include values associated with the Event Book – the key being to make the work fun.

The 'Ten Commandments'

1. Always with its master
2. Never sleeps
3. Always neat
4. Never lies
5. Always reports monthly
6. Never works in another conservancy
7. Always change's its forms once a year
8. Never shares incidents *("To avoid double reporting")*
9. Always lives in its bag
10. Never works without a smile

Other Results

The Annual Conservancy Performance Appraisal

As mentioned previously, at the end of each year a group of experts visits each conservancy and conducts an audit of the event book ending up with an annual monitoring report containing summary. The audits also provide an opportunity for re-training, eliminating design flaws, issuing new materials for the new-year, archiving, etc. In addition to the above audit process directly related to the event book system, the audit teams also completes an assessment of the the overall performance of the Conservancy (see Appendix for questionaire) and constructs a 'Performance Profile' (Figure 8). This profile displays the strengths and weakness of the Conservancy and provides an opportunity for CBNRM support providers to plan interventions to shore up the shortcomings.

FIGURE 8 – Performance profile

Impacts of the Event Book system?

The initial objective of the system was for local communities to improve their conservation decision-making. Communities have used the results towards improving their management which in turn have lead to spectacular increases in wildlife numbers in many parts of Namibia. They have used the results to reduce the number of human wildlife conflict incidents thereby making wildlife more acceptable to rural people. Apart from these direct conservation benefits one of the greatest benefits has been the empowerment that has emerged through the community having a better sense of what is

going on in their area. This puts them in a better position to engage with their stakeholders, and the information provides a common currency for these interactions. The increase in Conservancy pride has been remarkable leading to Government, NGO's and Investors treating the Conservancies more seriously. Communities are more confident in negotiations partly because of the pride they have in knowing that in some cases they have better information than even their neighbouring National Parks. They also have data that defends and counters dissenting emotive views regarding their resource utilization programmes. As a consequence of better data, communities have received more generous support and responsibilities for wildlife management from Government, which has in turn has resulted in local people setting more land aside for wildlife and tourism.

Interestingly, one of the greatest impacts has been the evolution of organizational management systems which are now being used to formalize other conservancy management systems such as financial and enterprise management. It has also being used to identify weak and strong community office bearers and has contributed to the institutional strengthening of a number of conservancies, which in turn has conservation and community development benefits.

A spin off has been that when the datafrom many communities are aggregated, they can be used in national-level reports. Data from all annual conservancy reports are captured into a national database and these aggregated data are used to generate significant parts of the annual 'State of CBNRM report' that is published by Namibia each year.

Expansion of the Event Book system?

The Event Book System was first started in late 2000 in a few community wildlife areas. Over time neighbouring communities saw the system in operation and also wanted to implement the same in their areas so that as of 2010 over 50 Conservancies are running various versions of the Event Book system. The success of the system in communal conservancies prompted the Namibian Ministry of Environment and Tourism to adopt the same approach in their National Parks. Exchange visits to Namibia also resulted in similar systems being developed in Mozambique and Tanzania (including marine parks), Botswana, and most recently Cambodia.

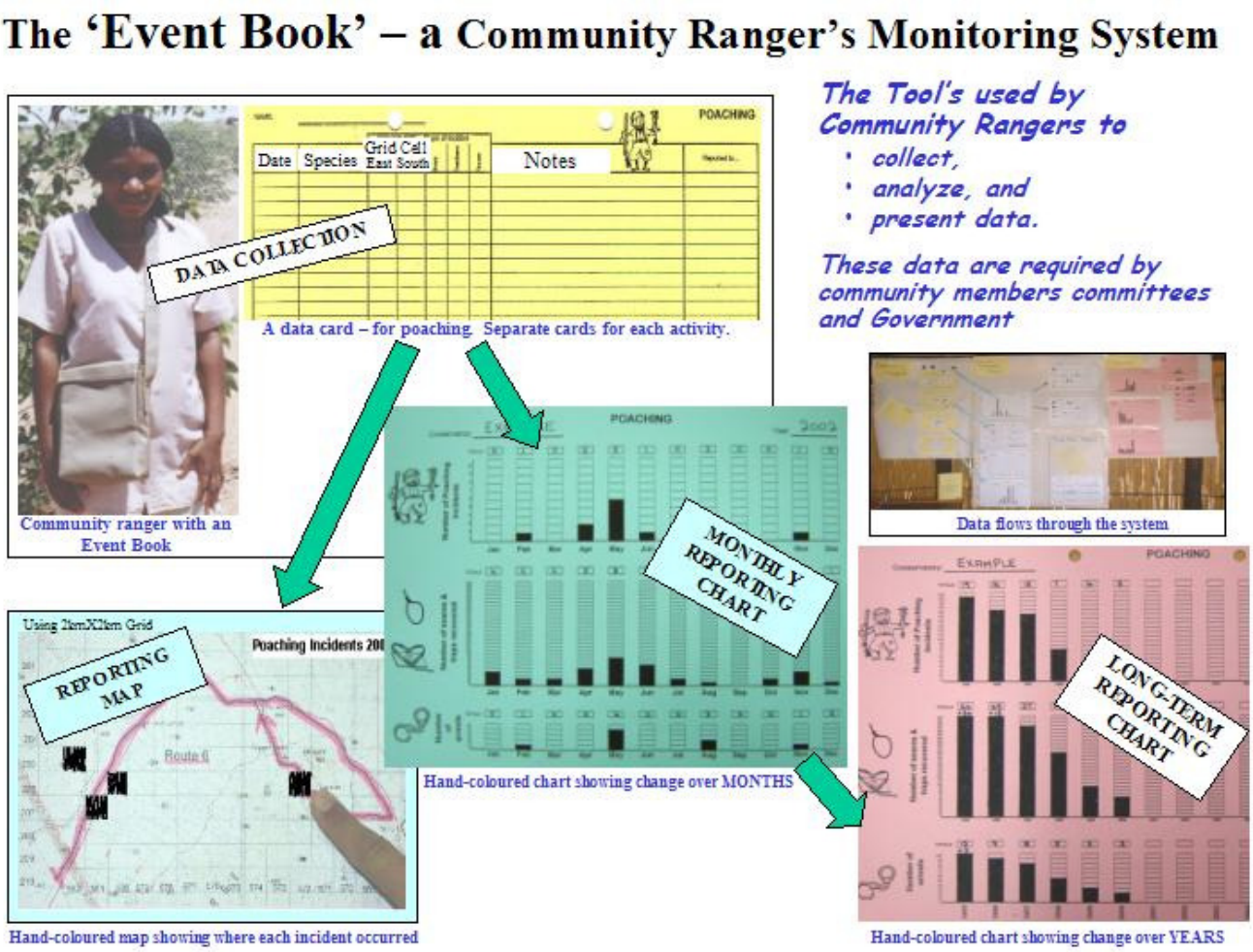


Fig. 1. Example of some 'Event Book' data collection and reporting tools that community rangers use on communal rangelands in Namibia, using the poaching module as an example.

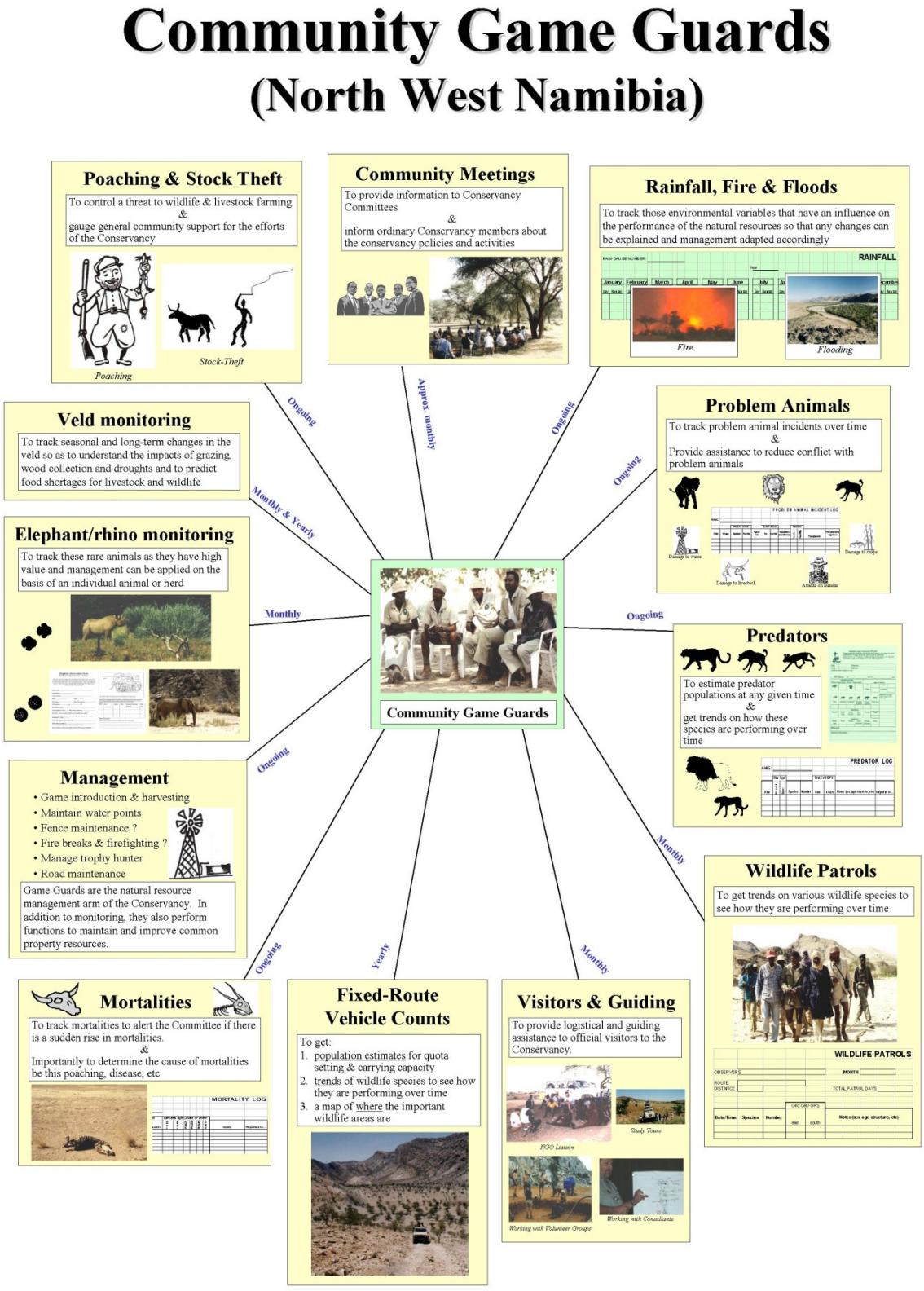


Fig. 2. 'Job description poster' of a community game-guard in a typical Conservancy in the arid north-west communal lands of Namibia.

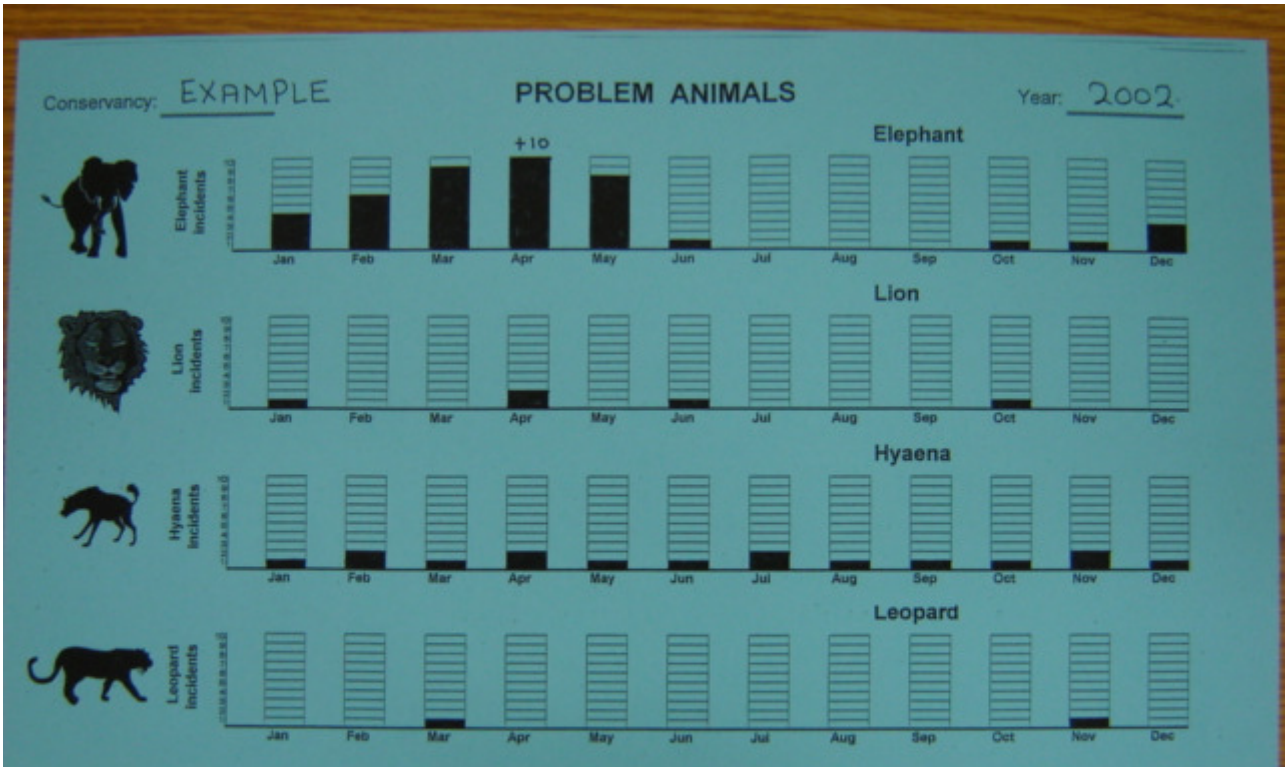


Fig. 3. Photograph of original hand completed blue monthly reporting chart for problem animals from the 'Event Book System'. The name of the Conservancy has been removed.

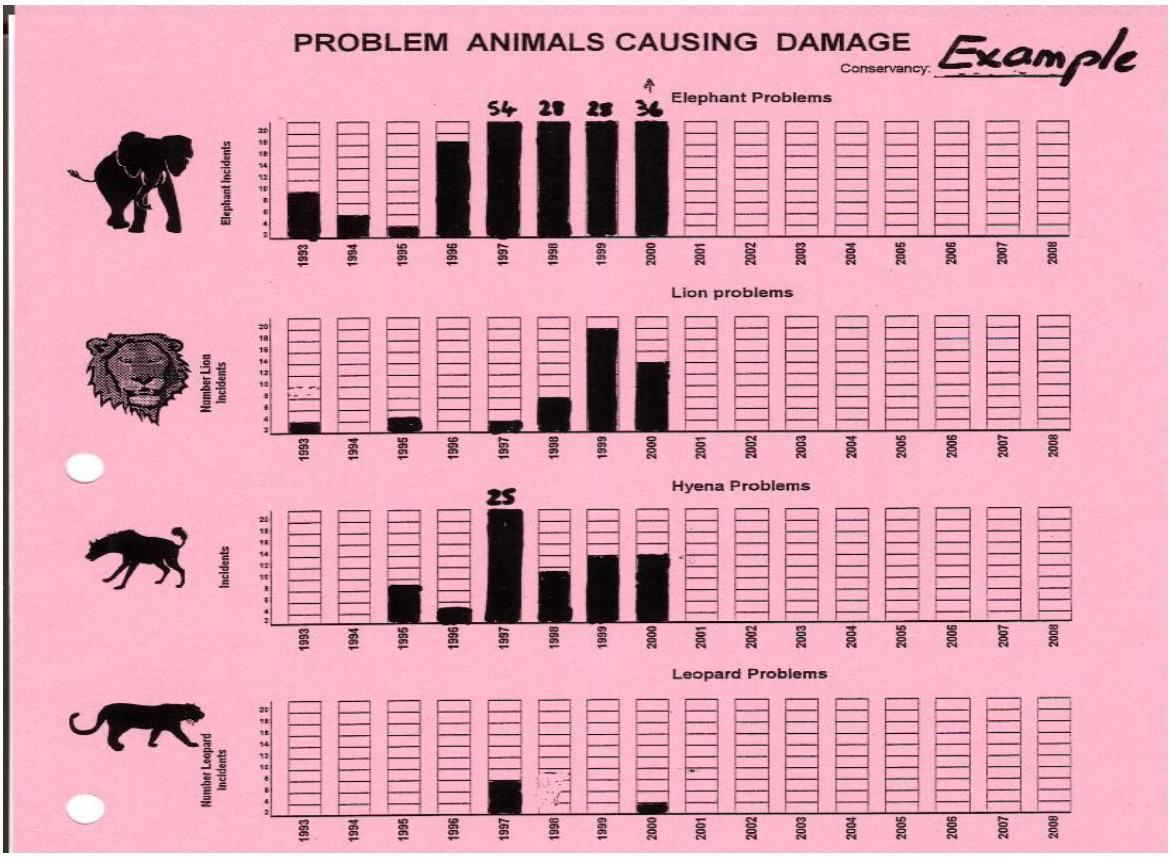


Fig. 4. Photograph of an original hand completed red trend data (change over years) from a Namibian community using the 'Event Book System'. The name of the Conservancy has been removed.

Fig. 5. A community game guard showing 'event book' results to a government official.

Fig 6. Community game guards compiling their monthly report using their specially developed data gathering diaries which are known as their "Event Books". Visitors from Cambodia are in the background looking on with a view to starting the same system in Cambodia.

Fig. 7. Filing box used to formalize the 'Event Book System' containing places for the 'Red', 'Blue' and 'Archive' files. The Conservancy's management plan is also housed in this filing box.

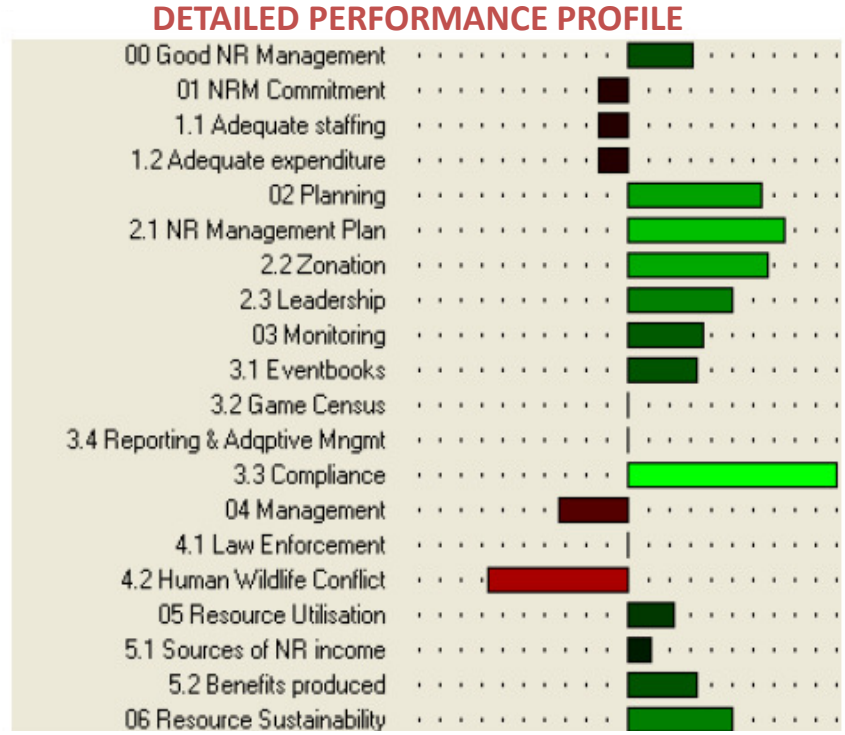


Fig. 8. Overall 'Performance Profile' for a selected Conservancy in Namibia, generated as a spin off following an event book audit

Handout 11

FIXED FOOT TRANSECT GAME COUNTS
(Steps to take when conducting a fixed foot game count)

PLANNING MEETING

- At least six weeks before the game count is due to take place a planning meeting needs to be held with all stake holders (MET, senior conservancy staff and support NGO's)
- At this meeting a count schedule must be drawn up as well as a list of MET and support NGO staff who will attend the count. The roles and responsibilities of these people during the count should be made very clear.
- A list of vehicles and drivers that will be needed for the count should be made.
- Funding for fuel, food and other items such as stationary and GPS batteries needs to be discussed and a person elected to source this funding from support NGO's.
- NGO staff will have to appoint people who will be responsible for buying food for the count.
- A person must be tasked with the preparation of all materials for the count.
- A central base camp with water must be agreed upon.
- A typed up schedule must be given to every participant at the planning meeting before they leave.

PREPARATION OF COUNT MATERIALS

- Commercial printing of count data forms must be done a few months before the count if they are to be ready on time.
- All count materials must be packed in a large tin trunk. It is preferable to have one large tin trunk than many smaller cardboard boxes. The truck can be locked which will prevent unauthorized people from helping themselves to GPS's and batteries etc.
- The following materials must be acquired and packed in the trunk:
  Count forms, clip boards, ball point pens, stapler with spare staples, paper punch, calculators, marking pens and flip chart.
- Enough GPS's for count teams need to packed. All GPS's should be checked carefully that they are working and if not replaced with a new one.
- Plenty of good quality AA batteries (preferably Duracell) must be bought for the GPS's
- Range finders with fresh batteries. (Only a well trained team leader should be issued a range finder as they are unreliable in untrained hands.)
- Laminated A4 count maps showing all numbered transects with their GPS co-ordinates must be packed. It is important to make plenty of these maps.

- A large map for training and planning each days count. This map should be put up in a central part of the camp for the duration of the count.
- A special file must be made to store all completed count data forms.
- Feedback posters will be needed for a feedback meeting on the last day of the count to all count participants.
- A lap-top computer (with all cables and mouse included) with the latest count database on it must be prepared. This computer should have an inverter with it so it can be run off a car battery if necessary.

PRE-COUNT TRAINNING AND PLANNING

- The day before the count starts should be set aside for training.
- It is essential to make clear to the group why a game count is important. The group should understand the three principal objectives: a) To estimate the numbers of wildlife in any management area (how many?) b) To be able to produce a game distribution map (where is the wildlife?) c) to monitor population change over time (trends – is wildlife increasing or decreasing?) The objectives of the count should be written up on a flip chart.
- Training must be given to the team leaders who will be operating the GPS's. It is essential that the team leader understands how to operate the GPS and how to change batteries when necessary.
- Training must be given on how to fill in the data sheets correctly. This is very important as most of the mistakes that are made during the count are on the data sheets.
- Training on the count maps must be given. Team leaders must be able to identify the transect line and its number that they are to walk and to read the GPS coordinates correctly.
- Distance training is very important. Teams are required to estimate the distance to the animal/s seen at right angles to the transect line they are walking on. As a group all counters should practice estimating distance using trees, tents, buildings, vehicles etc around the camp. Training can be given to those counters who show a particular ability to use a range finder correctly. Range finders can be very unreliable in the wrong hands and caution is advised as to who should use them. It must be clearly explained to the group that when a group of animals is seen which are running off that one person marks the original spot while the rest of the team count the animals. They should not all try to count the herd because they could forget where the animals were first seen. It is acceptable to occasionally pace out the distance if the group is unsure.
- It is important to emphasise several rules that must be followed: a) that the centre of the transect line and the area immediately next to it are priority areas for searching b) the distance measured must be to the animal (or centre point of the animals) before it runs away c) the distance measured must be at right angles to the transect line.
- Once training has been completed count teams must be selected. Teams should be no larger than five people. The names of counters and which team they are in should be clearly recorded on a flip chart. Each team

must have a team leader who is responsible for his/her team. The team leader is normally the GPS operator but this is not always the case. The team must have a scribe who is responsible for recording sightings onto the data sheet. The rest of the team should concentrate on finding animals and tracks. The scribe and GPS operator should walk together as the scribe will need to record the GPS position of animals seen.

- A count controller must be appointed. This person will be responsible for collecting all count forms at the end of the days count and checking that they are correct. The count controller will also be responsible for filing the forms and keeping them in a safe place.
- The count team leaders and NGO's will need to appoint camp cooks who will also be responsible for safe guarding food and looking after the camp while counters are out in the field.

PREPARATION FOR A COUNT

- It is very important to do all preparation for a count the day/evening before.
- Each team must know what transect line they will be doing the next day.
- Each team must be allocated a vehicle with driver to take them to their start position. The driver must know where the team is to be picked up at the end of the transect line. For this reason it is essential that all drivers have a GPS and a count map and be able to use them. The driver must agree on a departure time from camp with the team which will allow plenty of time to get to the start point. A responsible person should be appointed to wake the team in the morning.
- It is the driver's responsibility to check that his vehicle has a spare wheel, jack, wheel spanner, pump, tools and fuel. It is very important that the driver has water on his vehicle for the count team at the end of the transect line.
- The team leader must ensure he has a clip board containing plenty of data sheets, a pen and count map. He must see that he has a GPS with spare batteries and that his GPS is working.
- All counters must ensure that they have water bottles, food, hats and warm clothing (if it is cold) Good walking boots/shoes are essential.
- In areas with large numbers of dangerous game a competent MET officer with a firearm may be required on each team. On no account should a firearm be carried by any team member who has not been trained to handle firearms.

DAY OF THE COUNT

- All counts start at 07.00am. Drivers and count leaders must ensure they give themselves plenty of time to get to their start point on time.
- The team leader and driver must ensure that their team has been dropped off at the correct start point.

- Once the team has been dropped off the driver must proceed to the pick-up point at the end of the transect line.
- Before starting their transect at 07.00am the scribe must ensure that the following details are captured on the count form: a) Name of the conservancy b) the date c) the transect number d) names of the observers e) the start time f) the start kilometres on the GPS.
- Talking on the transect line should be keep to an absolute minimum.
- Always keep down-wind of dangerous game.
- Always look well ahead and sideways. Too many counters tend to look for spoor on the ground in front of them while walking and fail to notice animals up ahead.
- When an animal/animals or spoor have been spotted the team should all stop while the scribe writes down a) the species name b) the number of animals or spoor seen c) the distance (this may have to be done once the team has walked up to a point at right angles to the animal) d) the GPS reading.
- Only spoor less than one day old must be recorded.
- At the end of the transect line the scribe must ensure that the following details are captured on the data sheet: a) the end time b) the end kilometres.
- Once back at camp the team leader and the scribe need to sit together and add up the total numbers of animals counted and complete the count summary. When they are satisfied that the count form has been correctly completed the form must be handed in to the count controller.
- The count controller must recheck the forms for any discrepancies and if any are found must immediately find the team leader to rectify the problem.
- Once the count controller is satisfied that the count forms are correct the carbon copy of the count form (the blue copy) can be removed and put into the conservancies game count file. The original form (green copy) can then be stored in the count file.
- The count data can then be captured on computer by the count controller or some other appointed person.
- Counts are normally completed by mid day so plenty of time remains for preparation for the next days count.

COUNT FEEDBACK

- On the last day of the count a feedback session should be held for the participants on the count.
- A poster template is available for this feed-back which shows the total numbers of animals seen on the count for all transects.
- The feedback session is important to record participant's comments on improvements that could be made for the next count and to record local knowledge of game numbers.

GAME COUNT RESULTS

- Once all the count data has been captured on computer and checked for mistakes a game count results poster (A3) is produced. This poster is laminated and distributed to all the stakeholders concerned. The poster

shows numbers of animals seen on the count per conservancy as well as population estimates for each area. Trend graphs to show population change over the years are also included as well as count statistics.

Handout 12

ROAD GAME COUNTS

BACKGROUND INFORMATION

May 2001

OBJECTIVES OF COUNTING

Objective	Reasons why information is needed
1. Estimate the Numbers of game in any management area. [How many?]	It is important to know how many animals there are so that: • reasonable hunting (or capture) quotas can be set; • the stocking rate is known so as to minimize competition with livestock and to protect veld; and • the asset base of the wildlife can be ascertained.
2. Produce Game Distribution maps. [Where are they?]	To facilitate proper land-use planning (Zonation), it is important to know game distribution, especially areas of high game concentrations. Also these distributions can change in future years in reaction to rainfall or other factors such as water distribution or human settlement and it is important to know this.
3. Monitoring Population Change over time (trends). [Is wildlife increasing or decreasing?]	With successive censuses, graphs can eventually be drawn showing population fluctuations of each species (e.g. are springbok increasing or decreasing). This will tell the managers whether or not they are achieving their goals with respect to game numbers and consequently if it is necessary to change their management strategies.

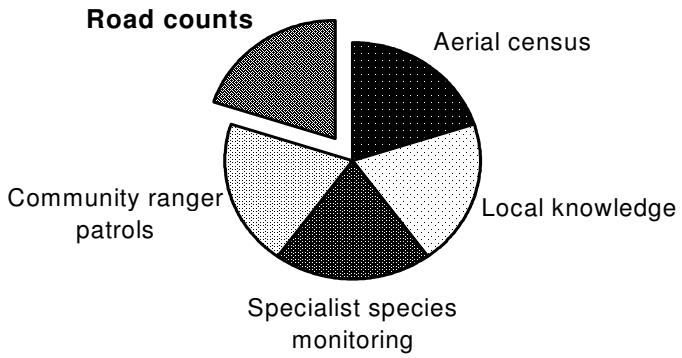
Trying to meet all of theses objectives with one count necessitates a number of compromise decisions. For example; using binoculars would greatly improve the accuracy of the count (i.e. determining Numbers). However, because binoculars will not always be available for successive counts, these have been banned because their intermittent use would diminish precision - making it more difficult to detect population Trend.

METHODS

A vehicle-based road count method is being used. It is recognized that this method will not yield good results for all species; especially smaller secretive animals, nocturnal animals, and animals in mountainous areas

where roads are often non-existent). It is also recognized that other monitoring methods (e.g. aerial census, foot patrols, specialist species monitoring) and local knowledge are also important sources of data. Consequently, the philosophy is that the road counts will augment rather than replace or compete with these other methods and initiatives.

Synergy between different monitoring approaches



The road count methodology has been specifically designed to be simple and inexpensive so that local people can implement this survey. This is essential for long term sustainability!

Technical Issues and Data Analysis

A part of the philosophy of local 'ownership' is that field people should be able to also analyze the data themselves without the need for sophisticated computers or statistical knowledge.

However, it is also important that the count results be scientifically robust and as accurate as possible. To achieve both local ownership and scientific accuracy, the road-count is conducted in a manner that allows the data to be analysed in two different ways:

1. using the conventional **Strip-Count** approach; and
2. the more accurate but more sophisticated "***Distance***" approach.

A brief layman's explanation of each of the two approaches follows.

The Strip-Count approach

The **Strip-Count** approach is intended to provide a quick field based estimate of population numbers whilst the ***Distance*** approach is an attempt to determine more accurate estimates. Both methods are essentially an attempt to develop Correction-Factors that adjust the numbers of animals actually counted to produce an estimate of the population (Objective 1).

In basic terms, the Strip-Count method involves counting all animals in a given strip and then estimating how many times the strip will 'fit' into the larger area. Estimating the size of the strip is a function of its length and its width (i.e. how far from the road can all animals be seen). Whilst the length of the strip is easy to measure, the width is more problematic

because it depends on which species (e.g. steenbok vs elephant) is being monitored and what the terrain is like (e.g. thick bush vs open plains).

In this survey each route has its own strip width. This can be roughly estimated in the field by using the datasheet below. The distance on the left and right of the vehicle is estimated every 1km along the route. The standard used is the max distance that a standing springbok would reasonably be seen from the back of a bakkie. Vegetation and 'dead ground' must be accounted for when estimating this distance. In the end, the average 'left and 'right' distances are calculated and then added together to give an average strip width. This estimate of strip width can be greatly improved, particularly also accounting for different species and differing seasonal conditions, by using the actual distances observed from the road to each group of animals sighted during the surveys. Once a sufficient number of such sightings have been accumulated over the years, it also becomes possible to develop a strip width for each species (remember that each type of animal will have its own unique sightability). In time, species level 'correction factors could be introduced into strip-count methodology but this then the these improvements could be made (but being careful not to loose 'user friendliness') but the real improvement will come about through the use of the *'Distance'* method.

Route Width ***Data sheet***

Km	Left	Right	Km	Left	Right
1			51		
2			52		
3			53		
4			54		
5			55		
6			56		
7			57		
8			58		

	Left	Right		Total width
Averages			=	

The width of each route is used for more accuracy when using the Strip-Count approach

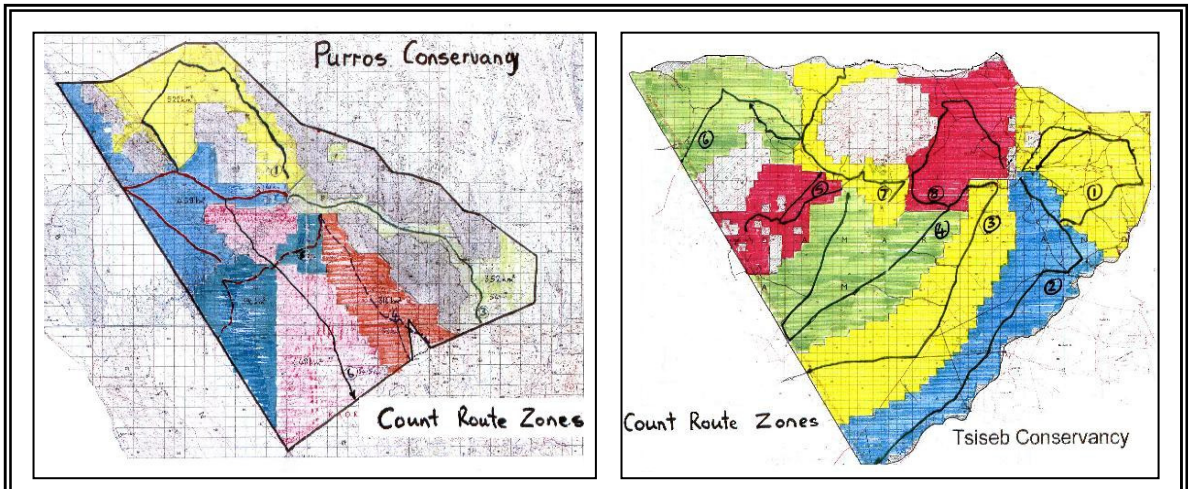
The length of each route is measured using the vehicle's odometer and driving time is recorded. Where a route follows a fenced boundary, only one side of the route is counted and the distance of the route along the fence is halved. All of these data are captured into a Route Statistics Table (see example below).

ROUTE STATISTICS (Road Count)

	Route 1	Route 2	Route 3	Route 4	Route 5	Route 6	Route 7	Route 8	Route 9	TOTAL
Transect length (km)	78	59	54	53.3	51	54.5				350
Transect width (km)	0.8	0.8	0.8	0.8	0.8	0.8				5
Hours & Min	*4h15 m*	*2h25 m*	*3h05 m*	*4h15*	*2h50*	3h20 m				*20h10*
Area sampled (km^2)	62.4	47.2	43.2	42.64	40.8	43.6	0	0	0	280
Area represented (km^2)	522	458	352	316	396	648				2692
Area excluded (km^2)	188	98	444	110	-	-				840
% Sample	12%	10%	12%	13%	10%	*7%*	-	-	-	10%
Correction factor	8.4	9.7	8.1	7.4	9.7	14.9	-	-	-	-

Total Area	3532	km^2

The area is also divided up into Count Zones where each route represents a certain zone. The Zonation (or stratification) is based on ensuring that the route reasonably accurately represents expected game densities within the specified zone. Certain areas that are not adequately represented by roads (e.g. mountains) are excluded entirely (see the table above) and no estimate is made for these areas – implying an under-estimate of the final figures. Also certain routes may almost represent total counts of a particular zone (e.g. if a route follows a narrow valley). Different habitats can be within one count zone provided the route traverses each of the habitats in equal proportion. It follows that the zones are NOT habitat zones. The zonation is done visually using the 2x2km grid overlaid on 1:250,000 topographical maps and geocorrected *TM* satellite imagery. Zonation decisions (i.e. in or out of a particular zone) are made at a scale of half-grid squares (i.e. one half of a 2x2km grid square could be 'in' whilst the other half could be 'out').

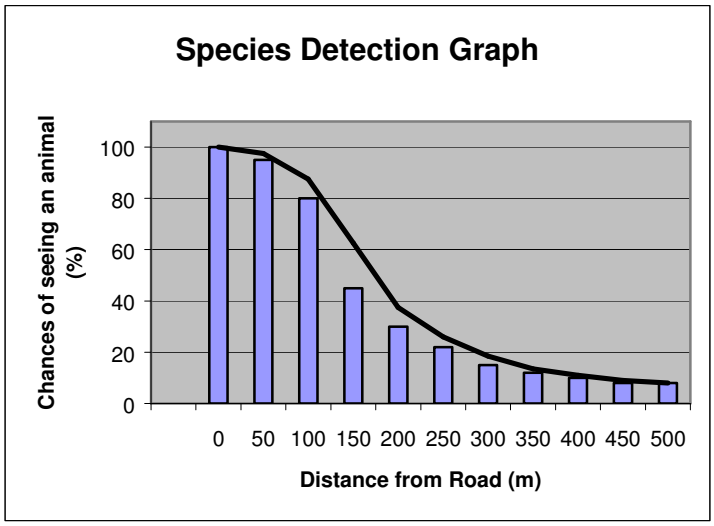


From the estimated strip-width, the length of the route and the zonation, a **Correction Factor** for each route or count zone is calculated, including an estimate of sampling intensity. These correction factors are used to convert numbers of animal seen along the routes into population estimates.

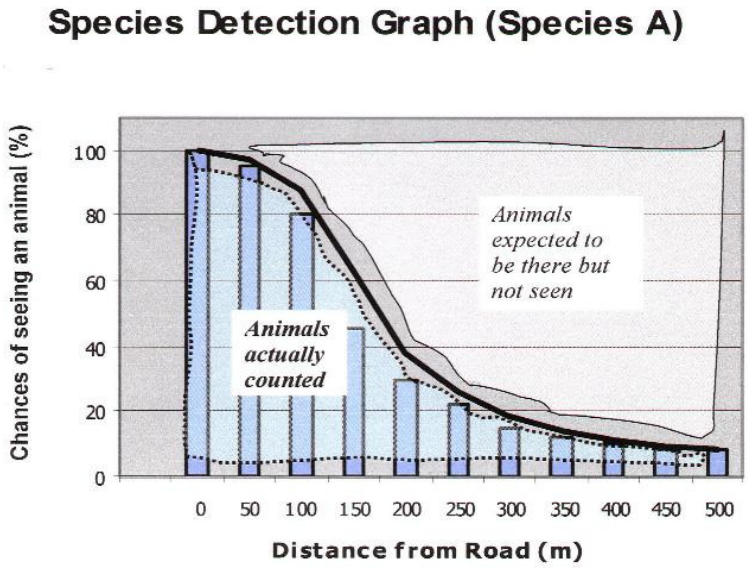
The Distance approach

The ***Distance*** approach is an attempt to determine more accurate population estimates. It is similar to the Strip-Count approach in that it attempts to estimate populations by applying a correction factor to the animals actually counted along the route. The essential difference is that the *Distance* approach develops a unique correction factor for each species. This is because it is obviously easier to see a large animal at 500m than a smaller animal at the same distance – implying that the 'strip width' for elephant would be very different to that for steenbok. Animal size is not the only issue to consider when determining a species-specific correction factor. Its colour, secretiveness, flight distance etc, all influence how easy it is to see a particular species. The *Distance* approach uses a rather complicated computerized programme to calculate these 'correction factors'.

To use the *Distance* approach in the field, however, does not require significant changes excepting that the perpendicular distance from the road to the animal sighted (or to the center of the group, if more than one animal was sighted) needs to be recorded. These 'distance' measurements are then used by the computer program to draw graphs (see example below).



Each species will have its own "Detection graph" and from this the computer will calculate a "Detection function" (the black line in the graph above). In conceptual terms, the computer looks at the area under the black line (i.e. the actual number of animals counted) and compares it with the area above the black line (i.e. the numbers of animals not seen). It essentially develops a ratio between animals seen and animals not seen. This ratio (or formula) is then used to arrive at the population estimate.



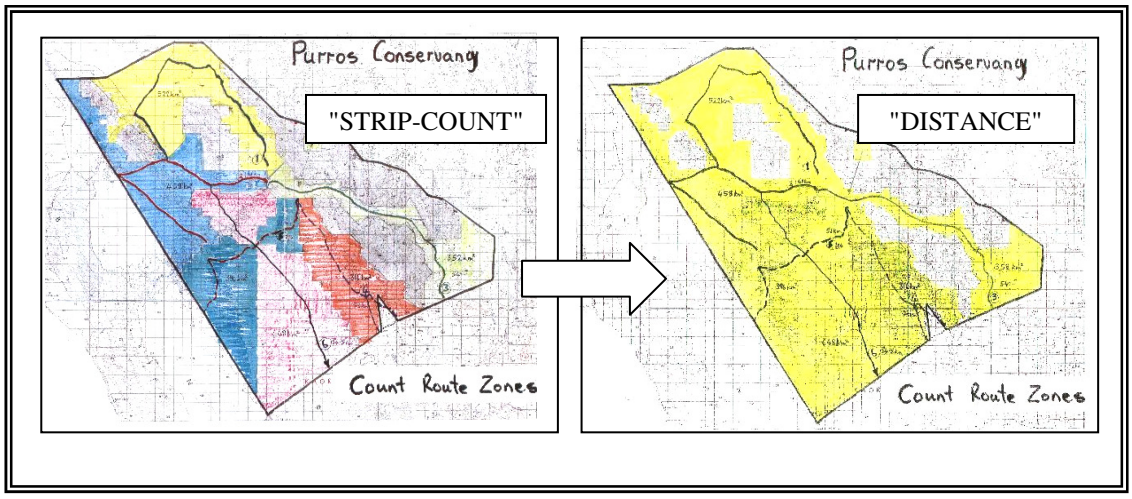
Assumptions

All of these assumptions must be met

1. All animals near or on the road are counted.
2. The distance from the road to the animals is to the point where the animals were before they run off.
3. The distance measurements are accurate.
4. The routes cover all areas in the count area – even low-density areas.

Some of these assumptions are very difficult to secure in the field but it is important that everyone be aware of these issues.

One of the most problematic issues is the representativeness of the routes (point 4). Unfortunately many of the smaller tracks in the North West follow certain features (valley and rivers) and largely avoid other features (such as mountains). To account for this during the analysis, all the routes are joined together (assuming one long transect. The *Distance* program produces a density estimate (animals per km^2) and it is important to understand that this estimate only refers to the route-zones identified during the zonation exercise; i.e. game numbers are not calculated for the zones excluded. This means that the populations are underestimated for the Conservancies as a whole! Covering these 'difficult' areas on foot or horse/camel is the only ground based alternative but this is problematic due to the huge size of the count areas. Fortunately the aerial census methods are able to 'fill these gaps' and this demonstrates the importance of the synergy of the various monitoring approaches. When combining the results of the two methodologies it important to remember that the road count estimates do not include these exclusion zones.



Example showing how stratification changes when using the Distance approach

Merging The Results From Different Methods

At the beginning of this document it was mentioned that the philosophy is that the road counts will augment rather than replace or compete with the other game monitoring methods and local knowledge. We are looking for the synergy between these different methods and this is done through bringing together, in one Table, game population estimates from the strip-count, *Distance* and Aerial Census.

Final Population Estimate Table

Species	Calculated Population			Usable Pop estimate	Comments and Discussion
	Transect Method	Distance Method	Aerial Census		
Elepha	272	**	**	150	Local intensive survey
Rhino	**	**	**	1	A known individual in the
Spring	3,014	5,888	4,415	5,500	Aerial census underestimates
Gemsb	1,018	1,236	1,907	1800	
Zebra	261	**	530	500	Ground counts do not access
Kudu	**	**	54	100	Whilst ground counts missed
Ostrich	840	980	853	1000	
Giraffe	15	**	24	30	Ground counts overestimated

The estimates are then compared and discussed with people who have local knowledge and a final usable population estimate is eventually agreed. This process is not strictly scientific but it is important to build 'ownership' of the numbers and not rely only on one method.

REMEMBERING THE OTHER OBJECTIVES

It is also important at this stage that we do not forget about the other two objectives we have:

i.e. (2) Produce game distribution maps [where is the game and how is it moving?]; and
(3) Monitoring population change over time [is wildlife increasing or decreasing?].

These two objectives are also achieved during the road counts by making a number of minor modifications to the field-work as follows:

For Game Distribution

<u>Fieldwork</u>

During the count the operators keep track of where all animals were seen. The specific instructions to the count teams are:

1. Constantly, as you drive the route locate yourselves on the Map. If no features are available then use the route odometer (or GPS) to estimate your location (each grid is 2km)
2. Record the location of every sighting, using the Conservancy's 2km x 2km grid square maps, onto the datasheet

<u>Analysis</u>

The objective of the analysis is to produce maps showing where the game was seen and eventually to compare game distribution maps over time. This is achieved through the GIS and can be done in two ways:

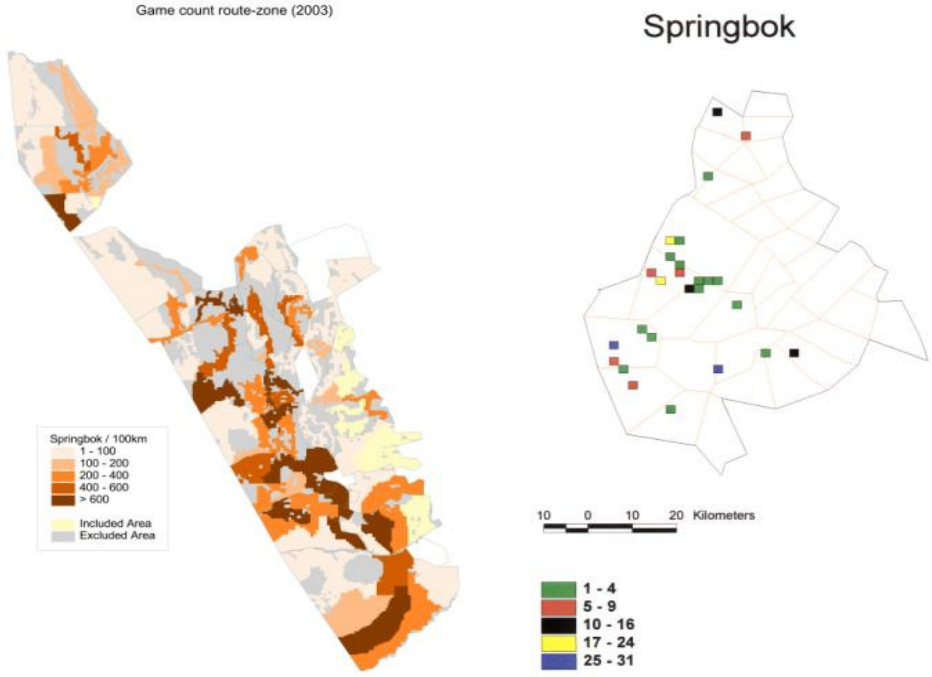
1. produce maps of actual numbers of animals seen in each 2kmX2km grid square; or
2. produce maps of game density (animals sighted per 100km driven) per route zone or management area.

The first method requires that each sighting be captured into a database. Separately, all cells that were visited by each route are also entered into the database table and using a SQL Connect, the database is linked to the GIS, which is used to generate the 2kmx2km game distribution maps. When producing these distribution maps, it is important to display all the grid cells that were visited during the count regardless of whether animals were seen in the cell or not.

The principles of the second method are the same but this time the animal distribution data is attached to polygons, which can be either management units (e.g. a conservancy) or a count route zone. In this instance, the game densities may be captured directly into a GIS table or preferably through linking with a database. The essential difference between this approach and the previous is that only the total sightings per route are captured digitally, rather than each individual sighting.

Results

Example outputs are illustrated below.



For Monitoring Population Trend

Fieldwork

A number of rules have been designed to ensure that 'sampling effort' on each successive count is as similar as practically possible. The following field rules have been devised to facilitate this as follows:

1. Use the same fixed routes each year
2. Do not use binoculars (yes, this will lead to underestimating game numbers and so this is a compromise between objectives [1] and [3])
3. Start each successive count at the same time of day e.g. at 7am
4. Always count from the back of a bakkie whilst standing
5. Never drive faster than 35km, even on good open roads as wind speed makes looking forward almost impossible

In addition to this, we encourage each Conservancy to select a number of key routes and repeat count these each month so that there is a monthly tracking of trend (a sub-sample of the area) in addition to the annual total area count.

Analysis

1. When the count teams return the Trend Tables (example below) are filled in with numbers of animals seen on each route.

	Number of animals seen on Route 10 on successive count dates							
SPECIES	**2 April 1999**	**11 March 2000**	**20 May 2001**					
Elephant	0	3	4					
Springbok	20	54	73					
Gemsbok	12	22	30					
Zebra	-	4	6					
Kudu	5	5	8					

2. It is important to ensure that each route was actually counted (if a particular route was not counted then more sophisticated analysis will be needed……..= don't go to next step, contact an ecologist who will attempt to make adjustments for different sampling effort)
3. If all routes are counted then it will be possible to draw trend graphs for each species (but only draw these graphs using the numbers of animal actually seen)

Results

Below is an example of what the eventual output could look like