NORTH WEST GAME COUNTS

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CONTENTS

BACKGROUND

Regular monitoring of the wildlife populations provides important information that is essential for sustainable management. Rural communities in northwestern Namibia are becoming involved in the management of wild animals through the registration of conservancies. Whilst conservancies are the dominant form of land use in the region, they adjoin freehold land, protected areas and privately run concession areas and so these areas are also important. Consequently, all stakeholders in the region, whatever their role, require some data on the wildlife resource in order to make wise decisions.

Monitoring has taken place in the area since before the early 1970's. The quality of these monitoring efforts has varied tremendously. Whilst a reasonable amount of information is available, one of the limitations has been that these monitoring efforts have not been consistent in terms of either methodology, spatial extent or timeliness. The earlier attempts have also tended to be undertaken in a sectoral manner – either by MET, NGOs or by communities.

A workshop attended by representatives from organizations of natural resource stakeholders in the northwest recommended that monitoring efforts should be more closely coordinated. Furthermore, the workshop recognized that no single approach or technique would satisfy all information needs. An approach was adopted whereby different monitoring methods should work side by side so as to create synergy between the approaches. The road counts reported on here form part of this approach.

Synergy between different monitoring approaches

Road counts

Aerial census

Community ranger patrols

Local know ledge

Specialist species monitoring

More specifically, we know that road counts 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 here that managers will need to look to the other monitoring methods (e.g. aerial census, foot patrols, specialist species monitoring) and local knowledge as important sources of data.

We emphasize again - the philosophy is that the road counts will augment rather than replace or compete with these other methods and initiatives.

Whilst the data produced are of prime importance, the road count has an additional role. Because the method is simple and inexpensive, local field-based people can implement the road counts with a minimum of equipment and scientific expertise. This makes it an inclusive activity that helps to develop working relationships between the different stakeholders. The data and information produced by this common activity provide a common currency upon which wise management decisions can be based.

In specific terms, the objectives and rationale for the northwest road counts are detailed in the table below.

OBJECTIVE	REASONS WHY INFORMATION IS NEEDED
1. Estimate the numbers of game [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 the 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. Monitor 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.

It is important to emphasize that the counts are intended to achieve all three of the above objectives. Consequently, whilst much discussion will focus on determining population estimates, the other two objectives should not be forgotten.

Trying to meet all three 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. A number of count rules were developed to ensure that the objectives were not compromised (Appendix 1).

METHODS

A vehicle-based road count was adopted because of the size of the area (in excess of 5million ha) and the inherently low game densities. The methodology evolved during 2000 through repeated field-testing in seven conservancies over a four-month period.

Because the northwest is an open system, there were fears that there could be significant movements between the different conservancies. Consequently, it was resolved to count the entire area over a short period of no more than three weeks. To achieve this the region was broken up into five count areas and the differing areas counted simultaneously.

A two-day planning meeting was held between a number of workers representing various government and NGO institutions (see Appendix 2). This meeting reviewed and agreed on the methodology that had been used in previous years. It also sorted out a host of logistical planning issues that covered both the count and subsequent data analysis.

It was agreed that the fixed routes used in previous years would again be used so that this survey would be comparable in terms of determining wildlife population trend. 118 routes (roads or tracks) were driven, totaling approximately 6290.6 km.

Immediately prior to the count, a training session was held with all observers, drivers and data recorders. The session started with a practical explanation of sample counting and then moved into a discussion of how the count would actually be conducted. A number of field rules were presented and their rationale fully discussed (see Appendix 1). Practical training in distance estimation and map reading followed. The training ended with a practical session where data sheets were filled in during an exercise that simulated a number of expected scenarios. The various count teams then attended to a number of logistical issues in preparation for an early morning start the following day.

people from conservancies, a number of private concessionaires, MET, NNF, IRDNC, RISE, DEA, SRT, WWF and a few private persons participated in the count (Appendix 3).

Observers stood on the back of open bakkies. They counted all game sighted and recorded their position on 2km by 2km grid-maps.

Prior to the count, satellite images of each area were examined for habitat. Each count route was allocated an area that the team felt was represented by the road being traversed. Some areas were not adequately represented by any of the routes (e.g. some mountains, dune fields, etc) and it was decided to exclude these areas during any population projections. The practical implication of this action is that almost 20% of the area is by default assumed to have no game at all. This is obviously not correct, as there certainly are animals in these areas. This means that the projected populations will inherently be an underestimate.

This 'intentional error' means that the final population estimates are likely to be extremely conservative and it is particularly important that this conservative approach be borne in mind when using the information for decision-making.

The logistical statistics for each count area are summarized in the following table.

		DETAILS ON ROUTES				DETAILS ON ZONATION				
Area	Management unit	Total route length	Total time taken	Number of routes	Average strip width	Area represented	Area excluded	% excluded	Total area	Average sampling %
1	Orupembe	273	14.1	5	0.657	2,259	1307	37%	3,566	8%
1	Sanitatas gap	42	3.5	2	0.616	368	140	28%	508	6%
1	Marienfluss	287	13.8	5	0.647	2,172	862	28%	3,034	8%
1	Purros	318	21.5	6	0.531	2,460	1104	31%	3,564	7%
1	Sanitatas	161	8.7	4	0.571	1,045	401	28%	1,446	8%
2	Anabeb	216	16.0	5	0.600	805	839	51%	1,644	18%
2	Etendeka concession area	109	19.9	3	0.650	357	150	30%	507	20%
2	Palmwag	557	47.7	11	0.532	3,335	2556	43%	5,891	9%
2	Skeleton Coast	315	25.9	6	0.685					
2	Sesfontein	310	22.4	7	0.473	1,246	1044	46%	2,290	11%
3	Omatendeka	213	13.7	4	0.457	858	774	47%	1,632	11%
3	*Okangundumba*	124	7.8	2	0.350	795	336	30%	1,131	6%
3	Orupupa	128	6.8	2	0.287	736	0	0%	736	5%
3	Ehirovipuka	277	17.2	5	0.323	1,422	562	28%	1,984	6%
3	Ozondundu	50	2.7	1	0.300	318	428	57%	746	5%
4	Sorris sorris	226	11.8	4	0.573	1,879	411	18%	2,290	7%
4	Tsiseb	629	29.4	8	0.744	6,685	1223	15%	7,908	7%
4	Huab	415	22.8	8	0.447	1,742	75	4%	1,817	11%
4	Doro !Nawas	517	28.5	9	0.612	4,184	240	5%	4,424	8%
4	Otjimboyo	67	4.0	1	0.649					
5	Torra	499	37.5	8	0.649	2,633	859	25%	3,492	12%
5	#Khoadi //Hoas	490	34.9	9	0.421	1,845	1513	45%	3,358	11%
5	*Hobatere*	68	5.8	3	0.296	245	13	5%	258	8%

NOTE: Because each route was considered an independent sampling entity, the average strip width and average sampling % in the table above are for indicative purposes only and should not be used in calculations.

Immediately following the count in each area, a debriefing meeting was held and the count data verified and discussed with all participants. Rough population estimates were made using field correction factors and comments and responses from local persons were recorded. It was emphasized to all present at these meetings that the estimates were extremely rough and that further analysis and feed-back was still necessary before any management decisions should be taken.

Followng the count, a workshop was held between some of the natural resource support people who participated and provided technical support during the count. These persons represented the following support organizations as follows: MET, IRDNC, SRT, WWF/LIFE, RISE and NNF. The objectives of the workshop were to:

- collectively analyse the data
- develop a reporting format, and
- agree on further follow-up steps

The meeting achieved these objectives. Individual conservancy/concession-area reports were prepared and the regional summary from all of these is detailed in this report. The follow-up resolutions are detailed in the minutes of the meeting and are available from the Natural Resource Working Group, Namibian Association of CBNRM Support Organizations (NACSO).

RESULTS

The results of the count will be presented in terms of the three count objectives described at the beginning of this report, ie:

1. population estimates,
2. game distribution, and
3. population trend.

Before presenting the details relating to these objectives, however, it is necessary to present the numbers of animals actually seen in each area during the count. These are presented in the following table.

Number of animals actually sighted during the June 2003 road count in the northwest of Namibia.

		1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5
	* TOTAL	Marienfluss	Orupembe	Purros	Sanitatas	Sanitatas gap	Anabeb	Etendeka concession area	Palmwag	Sesfontein	Skeleton Coast	Ehirovipuka	Okangundumba	Omatendeka	Orupupa	Ozondundu	Doro !Nawas	Huab	Otjimboyo	Sorris sorris	Tsiseb	#Khoadi //Hoas	Hobatere	Torra
Baboon	203											21	14	20				35				25		88
Caracal																								
Duiker	3											1			1			1						
Elephant	27			6					19	17						1								1
Gemsbok	3,465	86	227	191	569	73	23	217	235	792	125	40		19	8		76	1			63	201	251	287
Giraffe	178			16		9		47	22	13		33		4			1					26	15	3
Hyaena																								
Jackal	59	3	4	1	3		4	4	2	2		7	1				3	3		3		3	3	14
Klipspringer	20			3			1			2							1	6				7		
Kudu	241		1					1	2			4		1	3	9	6	7	4	1	1	91	4	108
Ostrich	795	27	69	96	24	34	26	28	54	49	41	16	13	7	52		109	2		27	20	27	4	90
Rhino	6								1															5
Springbok	16,094	305	641	180	535	168	546	846	2087	1239	99	95	253	547	71	12	1943	17	5	1380	1377	291	170	3926
Steenbok	121	1	5	3	1			2	7			11	3	5	11	1	4	26	4	4	4	17		12
Zebra	1,402	11		27	43	75	37	181	445	79		30					40	12			40	93	53	245

* Note that the Total column indicates the total number of animals seen during this count. This value may not agree with the sum of sightings listed for each conservancy due to shared routes.

1. Population Estimates

To achieve both local ownership and scientific accuracy, the road-count was conducted in a manner that allows population estimates to be determined in two different ways:

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

Readers wishing to obtain more background on the methodology are referred to a booklet " Northwest Game Counts: Background Information, 2001 (Natural Resource Working Group, NACSO).

The estimated population for each of the areas is contained in the table below. Importantly, this table contains the population estimates that were made without any manipulation other than accounting for areas not adequately surveyed (through zonation). These are the figures that emerge from a 'pure' analysis of the data.

		1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5
	TOTAL	Marienfluss	Orupembe	Puros	Sanitatas	Sanitatas gap	Anabeb	Etendeka concession area	Palmwag	Sesfontein	Skeleton Coast	Ehirovipuka	Okangundumba	Omatendeka	Orupupa	Ozondundu	Doro !Nawas	Huab	Otjimboyo	Sorris sorris	Tsiseb	#Khoadi //Hoas	Hobatere	Torra
Baboon	3,404	0	0	0	0	0	0	0	0	0	0	490	900	189	0	0	0	410	0	0	0	397	0	1020
Caracal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Duiker	57	0	0	0	0	0	0	0	0	0	0	35	0	0	16	0	0	6	0	0	0	0	0	0
Elephant	882	0	0	114	0	0	0	0	379	362	0	0	0	0	0	21	0	0	0	0	0	0	0	6
Gemsbok	37,024	1716	2844	3425	6732	846	99	1524	2892	8977	0	348	0	169	213	0	764	12	0	0	777	1315	2021	2350
Giraffe	1,990	0	0	293	0	104	0	354	298	169	0	318	0	35	0	0	15	0	0	0	0	156	227	21
Hyaena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jackal	635	14	45	19	29	0	23	19	19	26	0	162	5	0	0	0	34	31	0	48	0	23	13	125
Klipspringer	288	0	0	72	0	0	6	0	0	28	0	0	0	0	0	0	15	61	0	0	0	106	0	0
Kudu	2,021	0	17	0	0	0	0	5	13	0	0	35	0	0	80	191	77	56	0	11	15	662	37	813
Ostrich	9,471	243	896	1732	254	394	165	148	537	602	0	548	69	62	825	0	1383	16	0	345	267	179	55	751
Rhino	68	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
Springbok	173,270	3024	8354	2299	6812	1979	3138	3957	25576	10542	0	1164	1694	4852	1797	254	22012	216	0	15427	20880	3442	894	34837
Steenbok	1,697	15	64	57	13	0	0	11	97	0	0	304	193	44	207	21	57	267	0	51	54	144	0	98
Zebra	15,211	160	0	569	552	869	139	1292	6681	536	0	234	0	0	0	0	588	199	0	0	496	554	433	1909

Manipulating the population estimates in order to be Conservative

As in previous years, it was decided to take a cautious approach and manipulate the population estimations to account for the following issues of concern:

- A number of extremely large herds of springbok were seen on some routes and it was felt that population numbers would be overestimated if these large herds were simply multiplied by the route's correction factor.
- Many people felt that the effective strip width was considerably wider than that estimated during the count. If the strip widths were actually wider than estimated, then this would lead to exaggerated population estimates.
- People with local knowledge of the areas were concerned that whilst they knew that certain species were present or had an idea of the sizes of known herds, the estimates of these species were inadequate (absent or too low).

Concerns over sampling distribution (i.e. ensuring that the routes covered all habitats and did not concentrate around high game density areas) were also raised but as mentioned earlier, these concerns were addressed through the zonation exercise. The effect of the zonation would in effect cause the population to be underestimated. Because large areas were excluded from the analysis, the default effect of this is that it the method 'assumes' that there were NO animals in these areas! It was nevertheless acknowledged that in future years the zonation could be improved.

As previously, the concern over the impact of the few extremely large herds was mathematically addressed by excluding any herd in excess of 100 animals from the population estimation calculations. The animals in these large herds were later added to the population estimate (because these animals were *definitely* present) (see equations below).

Normal population estimate equation

NS * CF = Population estimate

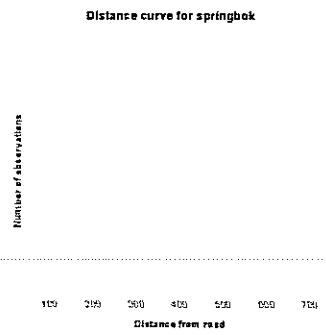
Population estimate equation that accounts for the influence of larger herds

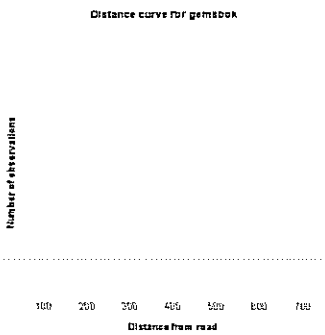
((NS – LH) * CF) + LH = Population estimate

Where: NS – Numbers of animals seen
CF – Correction factor
LH – large herds: numbers of animals in herds greater than 100 individuals

In total, 7777 springbok (in 31 herds) were excluded from the population projection calculations. Whilst these herds were treated as outliers in the calculations, in reality they are not that rare - 31 herds of this size were seen! This manipulation is likely to have resulted in extremely conservative estimates.

The effective strip width was another area of concern. The northwest is largely open terrain and casual observers commented that the effective strip widths used in the determination of correction factors seemed to be too narrow. This was investigated by developing frequency diagrams on the distance data for a number of the more common species (refer to distance profiles).





To most people's surprise, the distance profiles confirmed that the effective strip widths were indeed much narrower than expected. This was largely accounted for by the amount of 'dead ground', vegetation, terrain, speed of vehicles, observer fatigue, not using binoculars (to identify the species of animals seen at distance), etc. The strip width estimates for each route could still be considerably improved and, in the longer term, each species should have its own strip width.

Final population estimates

These were derived through a combination of 'science and art'. The science has been discussed above. The art involved triangulation with other sources of information such as specialist species monitoring, past aerial census and local knowledge.

	TOTAL	Animals per 5000ha	1 Marienfluss	1 Orupembe	1 Purros	1 Sanitatas	1 Sanitatas gap	2 Anabeb	2 Etendeka concession area	2 Palmwag	2 Sesfontein	2 Skeleton Coast	3 Ehirovipuka	3 Okangundumba	3 Omatendeka	3 Orupupa	3 Ozondundu	4 Doro !Nawas	4 Huab	4 Otjimboyo	4 Soris sorris	4 Tsiseb	5 #Khoadi //Hoas	5 Hobatere
Elephant	510	0			20			5		50	60		50	30	20	20	30	50	10		30	25	50	20
Gemsbok	33,725	32	1500	2800	4000	5000	800	300	1500	3000	7000		800	150	200	80	20	500	50		25	600	1300	1800
Giraffe	1,288	1	7	13	100	15	15		100	200	170		300	4	40	5	2	16	0		5	0	156	100
Kudu	3,081	3	20	50	0	30			100	350			150	80	70	60	150	150	150		11	60	700	600
Ostrich	7,856	8	300	900	2000	250	400	100	150	500	500		500	100	70	180	20	700	16		200	300	180	40
Springbok	90,660	87	3000	6000	6000	4500	2000	3140	4000	12000	7000		1000	2000	4000	900	200	6000	220		3000	6000	2050	650
Zebra	14,525	14	160	150	600	500	600	140	1300	6500	400		600	40	100	30	40	400	100		15	300	550	600

2. Game Distribution

Game distribution maps for any of the species found can be generated by using the CBNRM GIS. These can be produced at any scale (up to A0 in size) or for any given area. A few examples are included at the end of this report. It is necessary to bear in mind that the distribution maps are only as good as the survey coverage and so they should be viewed in conjunction with the 2km x 2km grid coverage map.

3. Population Trend

For tracking population trend over time it is best to avoid using population estimates. Confusion can arise because different correction factors are inevitable used over time. Consequently, only the numbers of animals actually sighted will be used for trend monitoring in the North-West.

Number of animals seen during the count

	June 2001	June 2002	June 2003	June 2004	June 2005	June 2006	June 2007	June 2008	June 2009
Baboon									
Caracal									
Duiker									
Elephant									
Gemsbok									
Giraffe									
Hyaena									
Jackal									
Klipspringer									
Kudu									
Ostrich									
Rhino									
Springbok									
Steenbok									
Zebra									
Distance (km)									

In the longer term it is highly likely that new routes may be added and some routes may be removed from the annual survey. To make the results comparable between years, the sampling effort (i.e. number of km driven) needs to be standardized in some way. The numbers in the table below are expressed as the number of animals seen during the game count per 100km driven.

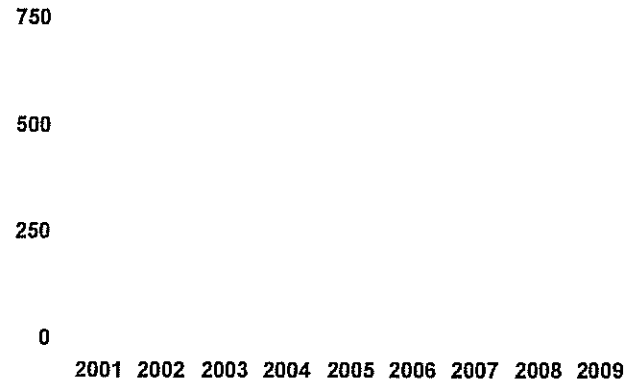
Number of animals seen per 100km

	June 2001	June 2002	June 2003	June 2004	June 2005	June 2006	June 2007	June 2008	June 2009
Baboon									
Caracal									
Duiker									
Elephant									
Gemsbok									
Giraffe									
Hyaena									
Jackal									
Klipspringer									
Kudu									
Ostrich									
Rhino									
Springbok									
Steenbok									
Zebra									

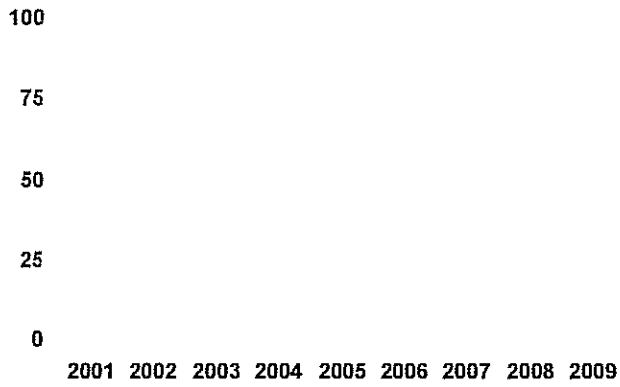
Once sufficent successive counts have been undertaken, wildlife population trends can be presented.

Total numbers of animals seen per 100km driven

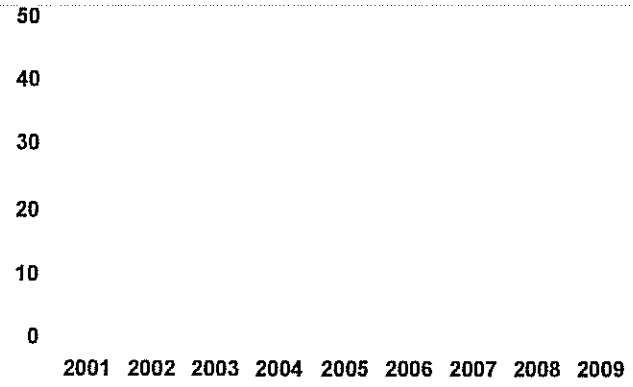
Springbok



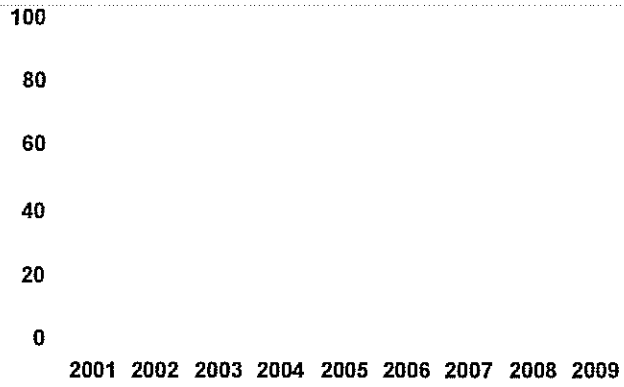
Gemsbok



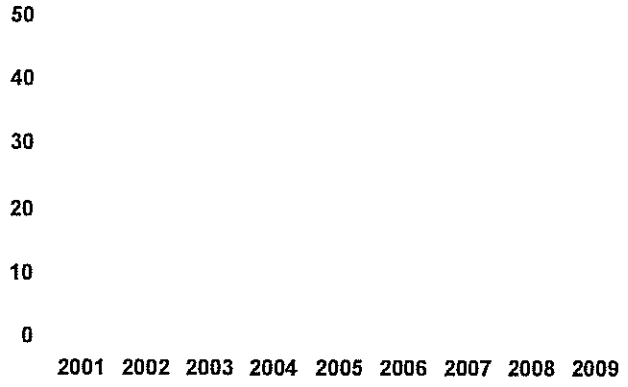
Kudu



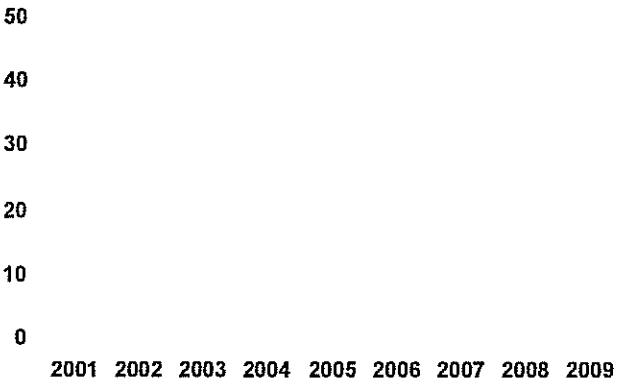
Zebra



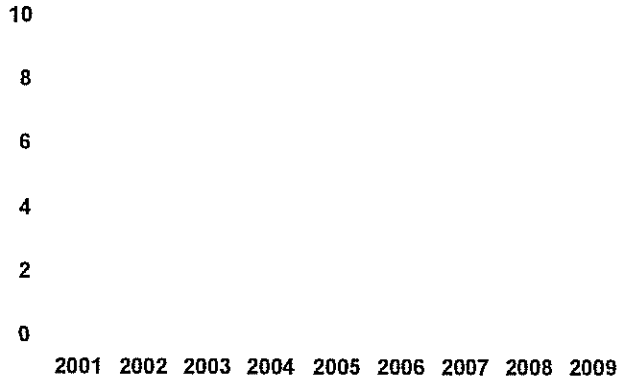
Ostrich



Giraffe



Elephant



Total number of animals seen

	Elephant	Gemsbok	Giraffe	Kudu	Ostrich	Springbok	Zebra
2001	40	1587	218	261	577	11678	1215

2002
24
2703
199
297
659
14554
1274
2003
44
3484
189
241
815
16733
1411

Total number of km driven:

2001
6509
2002
6056
2003
6291

DISCUSSION

Whilst the survey achieved much, there is still room for improvement as follows.

1. At present only the strip count approach has been used to determine population estimates. Currently there are insufficient observations to use the DISTANCE program (except perhaps for springbok, zebra and gemsbok). Data from this and subsequent surveys can be added to determine improved "detection functions" (i.e. better "distance graphs") and in future years the results from the more sophisticated data analysis will be included in the count report.
2. The count should always be integrated with neighboring conservancies so that a regional picture of game can be developed and to account for seasonal movements.
3. This information should be integrated with other sources of information such as foot patrols and aerial census.
4. More 'fine tuning' of correction factors (i.e. strip widths and zonation) should take place in future years. Importantly, improved correction factors can be used in subsequent years as this only affects the population estimates (objective 1). The correction factors have no impact on trend or distribution (objectives 2 & 3) as the latter only use actual sightings.

In terms of repeating this survey we recommend the following.

1. Training in distance estimation prior to each count is important.
2. Make sure that the same routes and methods are followed each year. No new routes should be added (excepting for the new conservancies). No routes should be dropped. Keep the field work the same each year even if in time the method is found to be inefficient. Deviating from the original method in a monitoring programme plays havoc with later interpretation of trend. The detailed descriptions of each route are in the respective conservancy/concessions' Game Census File and in the CBNRM
3. GIS.

CONCLUSIONS

This count has successfully provided data that can be used for population estimation for a number of the more common species. It has provided some data on game distribution in the North-West but this needs to be read in conjunction with the sampling coverage. The count has successfully provided another data point for monitoring long-term population trend for a number of species. The count is not perfect. Improvements are necessary and information from other monitoring programmes are essential, particularly for those species not well represented by this count.

The following actions are recommended:

1. The count should be repeated each year in June, using the same routes and method.
2. The route zonation and strip-width estimation should be continually improved so as to arrive at better estimates of game populations.
3. A few routes in the high density game areas should be resurveyed every three months to help "fine tune" the yearly counts and provide better 'trend' data. At least one route should be done per management area (conservancy or concession).
4. A small working committee should be formed to organize next year's count.

Finally, it should be recognized that the count has values other than the data it produces. It also serves an important team building and information exchange function. Once a year, it gets people out into the veld, often in areas they have never seen before.

APPENDICES

1. Field Rules for the Northwest Game Count
2. Northwest Game Count Planning Committee
3. Participants in Northwest Game Count
4. Map of 2 x 2 km grid cells covered in the count
5. Distribution maps for selected species

Appendix 1

Road Count Rules

A number of field rules have been developed to ensure that the assumptions are upheld. They are as follo

1. **Centre line (the road and immediately next to the road) are priority areas for searching.**
2. **Distance must be to the animal before it runs away**
3. **Distance must be at right angles to the road**
4. **Distance is to center of groups of animals (before the group moves away)**
5. **Where the route travels next to a fence only the animals inside the fence are counted (the route distance is then halved for that section of the route)**
6. **Routes must represent all habitats proportionally (i.e. also count low density areas)**
7. **Measure strip width per route**
8. **Only count adults and sub-adults - make a note of numbers of newly born juveniles (or newly hatched chicks – ostriches)**

For *TREND* analysis, a number of additional rules were added:

9. **Fixed routes will be used for subsequent counts**
10. **Start time is at sunrise**
11. **No binoculars to be used (knowing that leads to underestimation of numbers)**
12. **Always count from the back of an open bakkie**
13. **Speed must never exceed 35 km/hr**

For Game distributions, an additional rule was added:

14. **Location of each sighting is mapped using the Conservancy's 2km x 2km grid square maps**

Appendix 2

Northwest Game Count Planning Committee

NAME	INSTITUTION	FROM WHERE	CONTACT

Appendix 3

Participants in Northwest Game Count

NAME	INSTITUTION	FROM WHERE