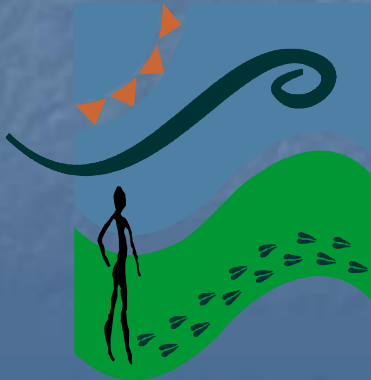


PRECISION OF LARGE UNGULATE AERIAL SURVEYS IN MADIKWE GAME RESERVE IN THE NORTH WEST PROVINCE

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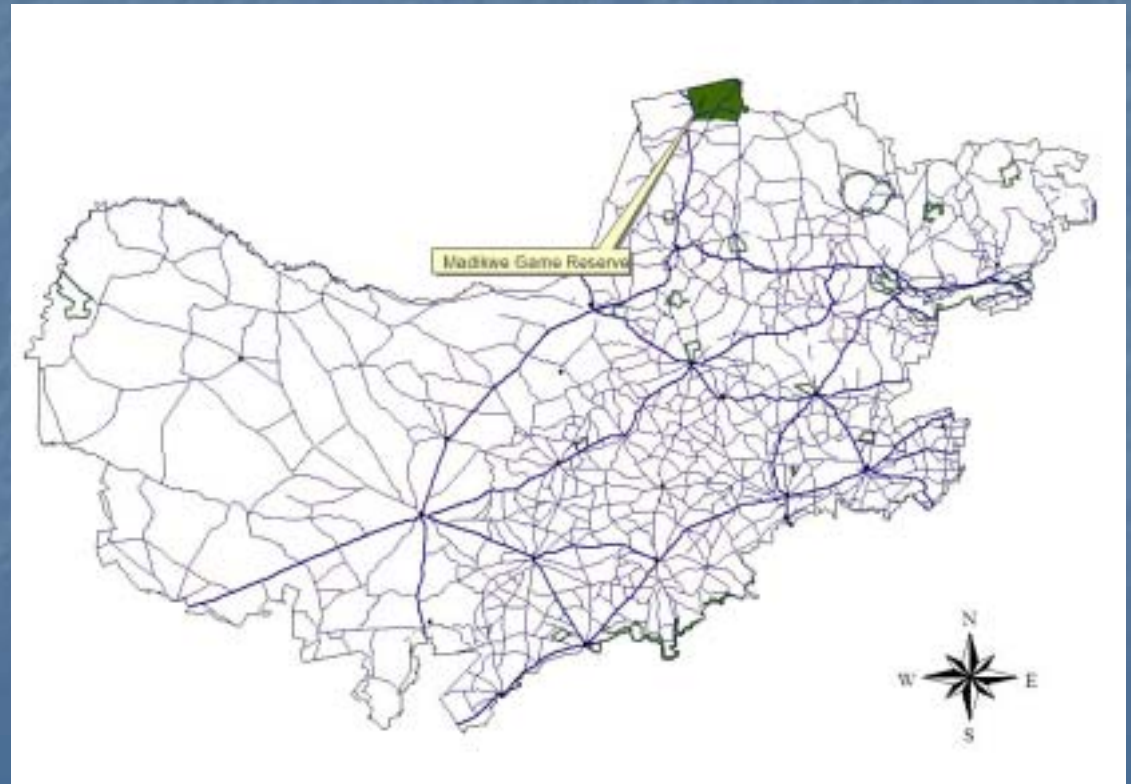


Introduction

- Conservation agencies in South Africa are under increasing pressure to apply “fair value” reporting on assets.
- The North West Parks and Tourism Board have been disclosing its game assets in its financial statements for a number of years, and the challenge still remains to achieve an unqualified report on the game numbers.
- One of the main reasons is that the variance of the annual aerial surveys are either unknown or not within acceptable margins.

Study area

- Madikwe Game Reserve
- Located on the northern boundary of the North West Province
- Under the management of the North West Parks and Tourism Board

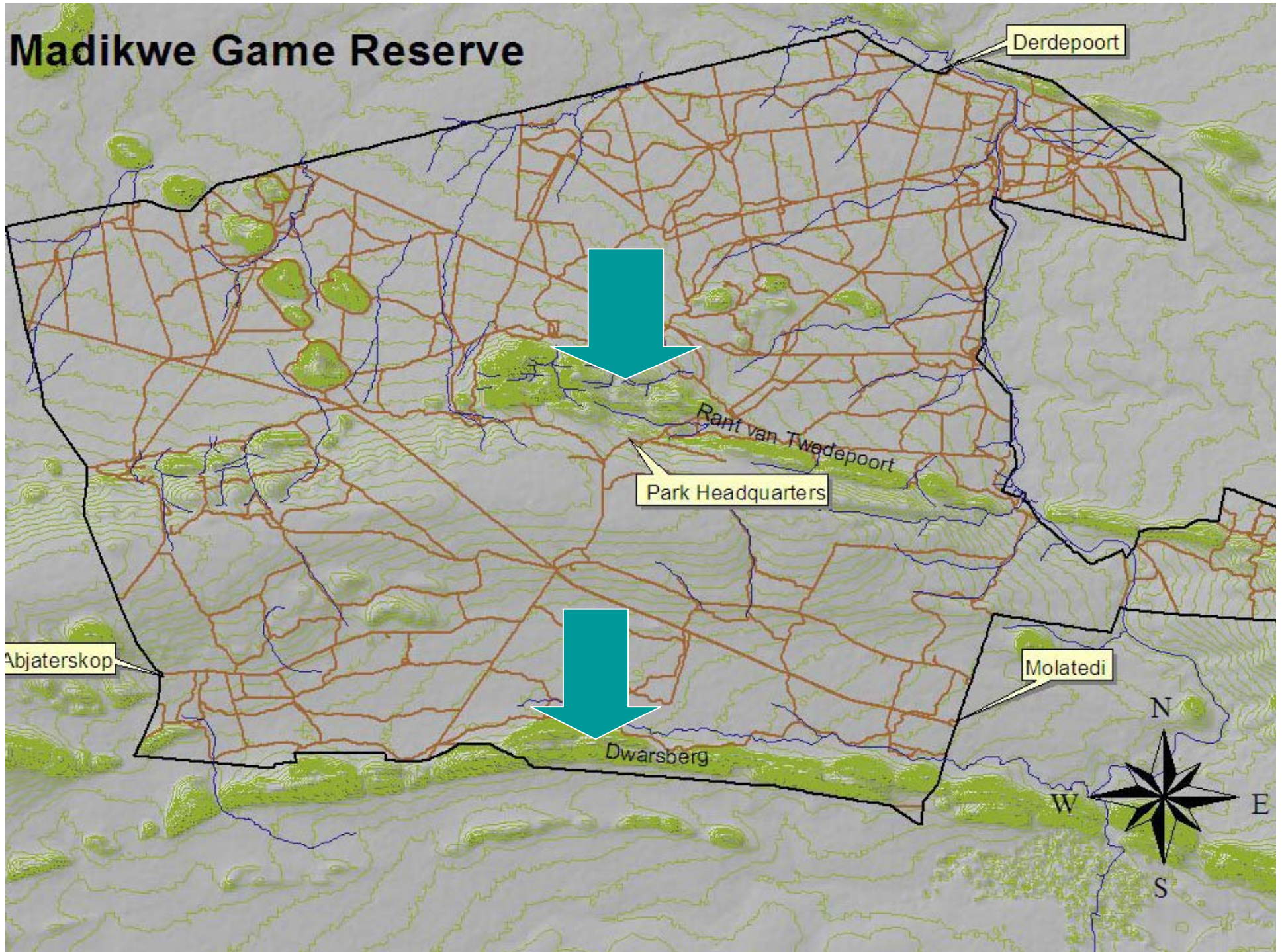


Study area

- Approximately 65 000 ha in size
- Situated in the savanna regions of the North West Province
- Topography is fairly homogenous with a ridge running through the centre of the reserve, effectively dividing the area in two



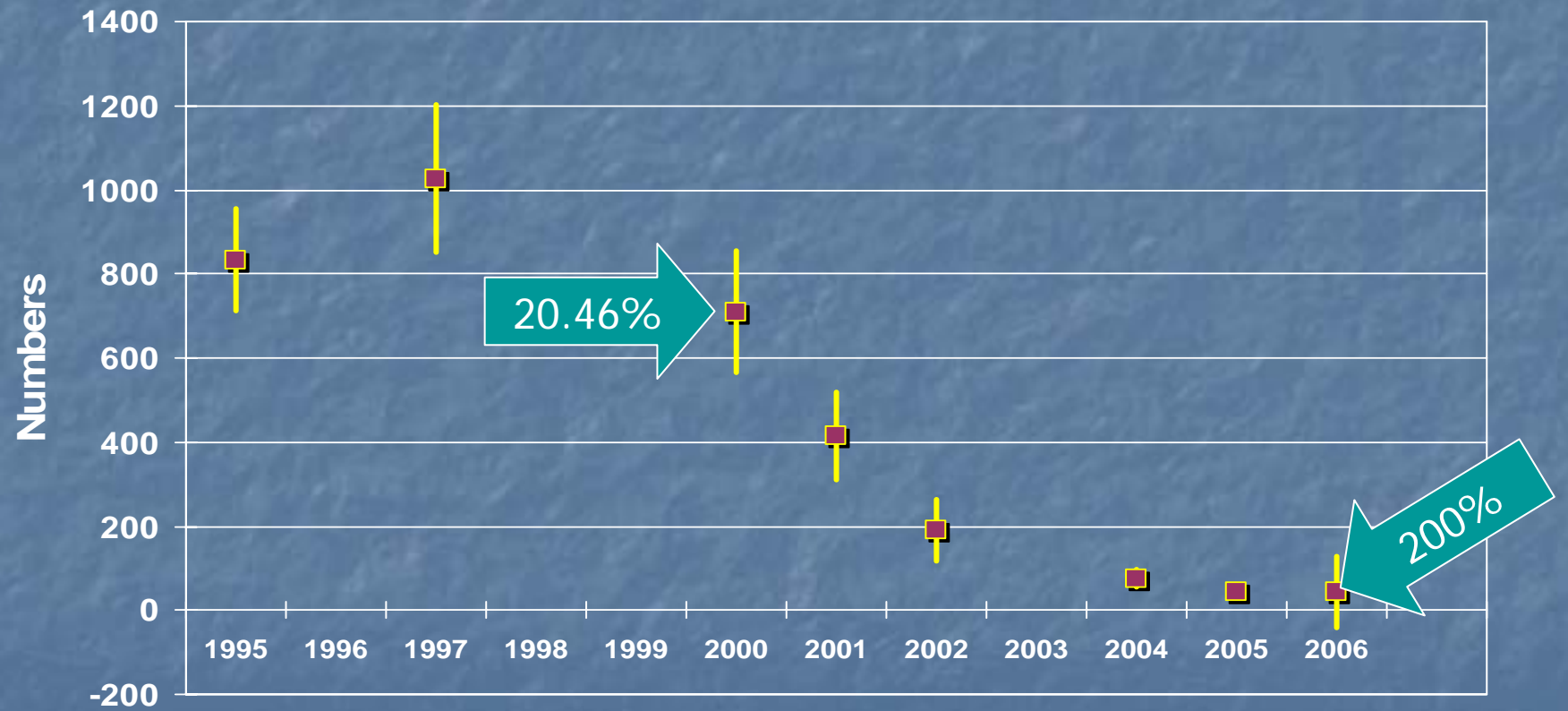
Madikwe Game Reserve



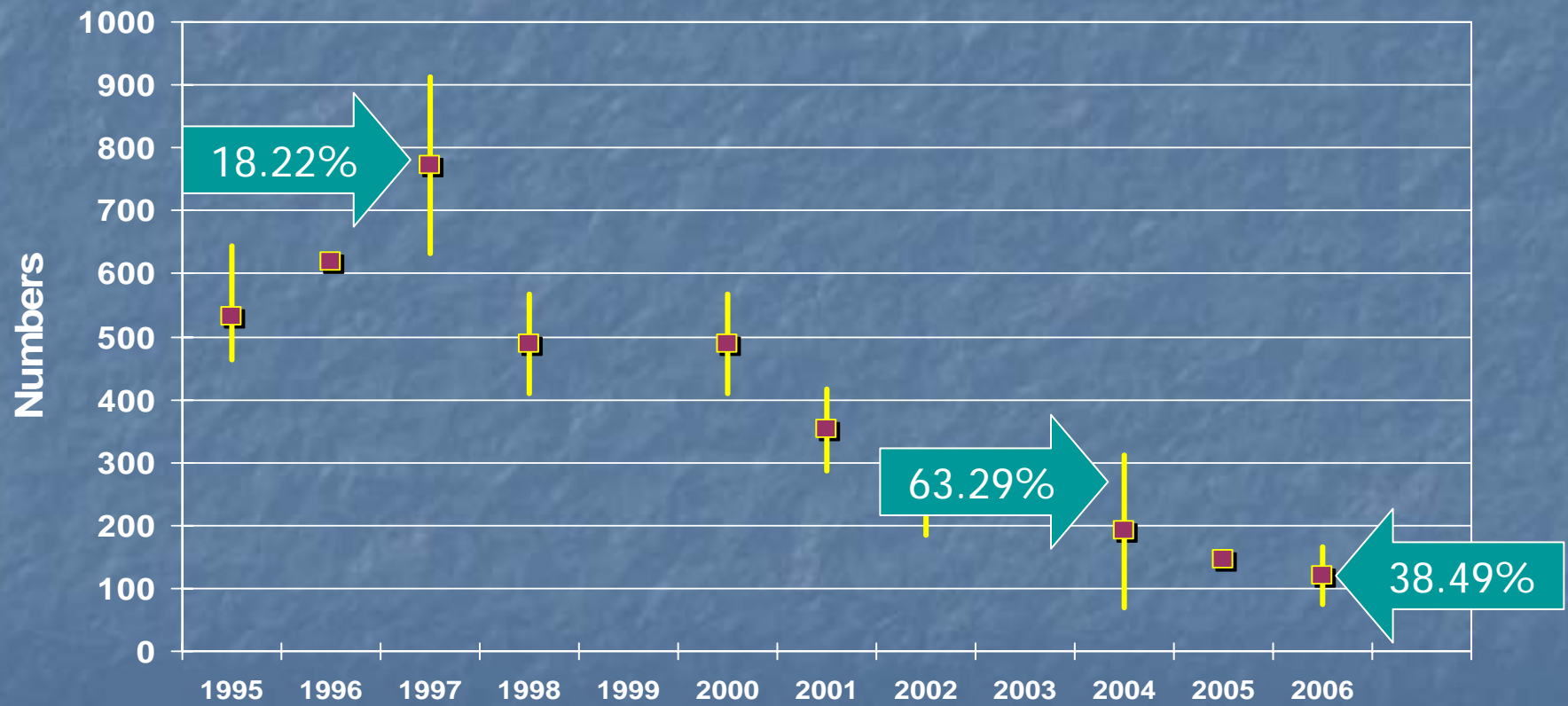
History of game counts in Madikwe Game Reserve

Year	Survey strategy	Counts	Coefficient of variance
1995	Sampling	Aerial Line Transect Distance sampling	✓
1996	Sampling	Aerial Line Transect Distance sampling	
1997	Sampling	Aerial Line Transect Distance sampling	✓
1998	Sampling	Aerial Line Transect Distance sampling	
1999	Non-sampling	Line transects	
2000	Sampling	Aerial Line Transect Distance sampling	✓
2001	Sampling	Aerial Line Transect Distance sampling	✓
2002	Sampling	Aerial Line Transect Distance sampling	✓
2003	Non-sampling	Aerial Line transects	
2004	Non-sampling	Aerial Line transects; high/low density replicates	✓
2005	Non-sampling	Aerial Line transects; high/low density replicates	✓
2006	Non-sampling	Aerial Line transects; 33% replicates	✓

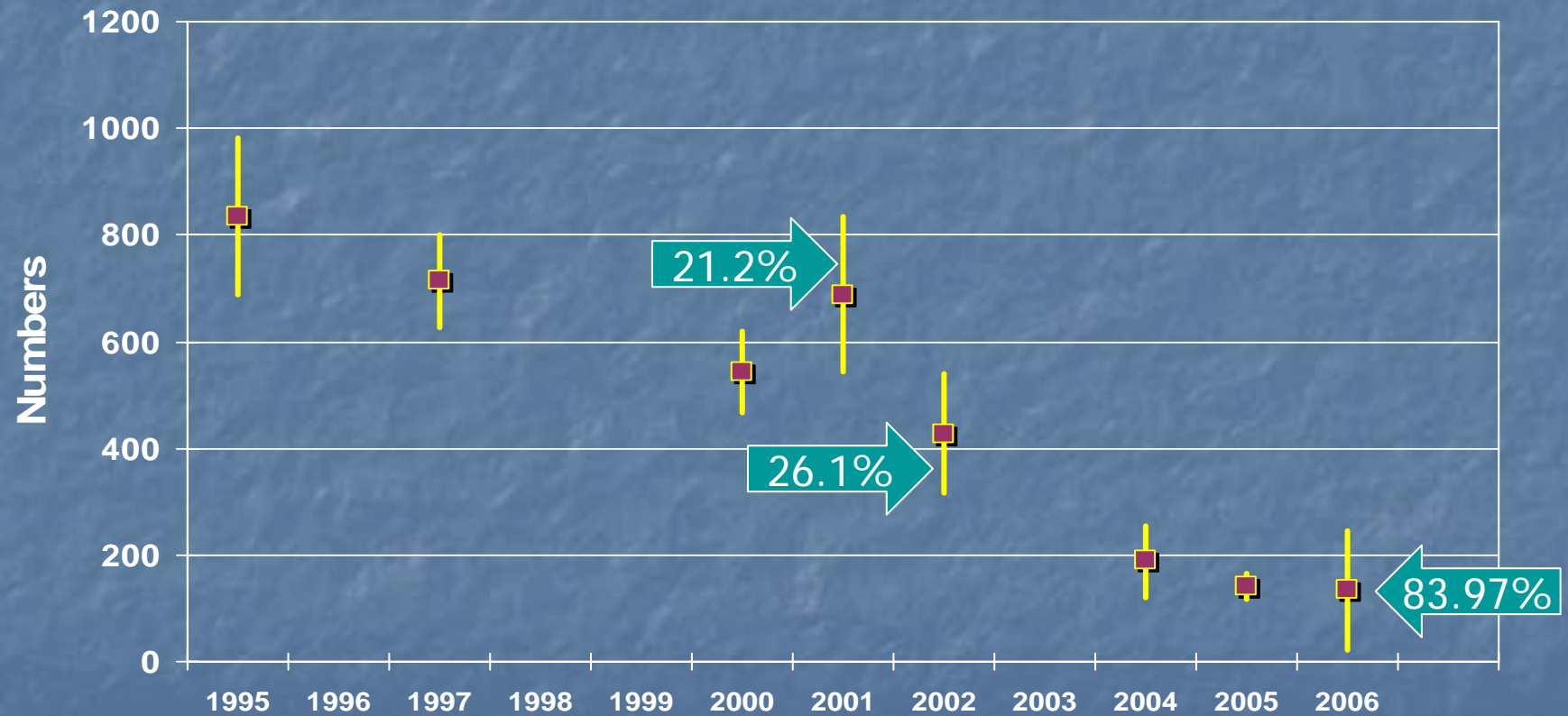
Eland



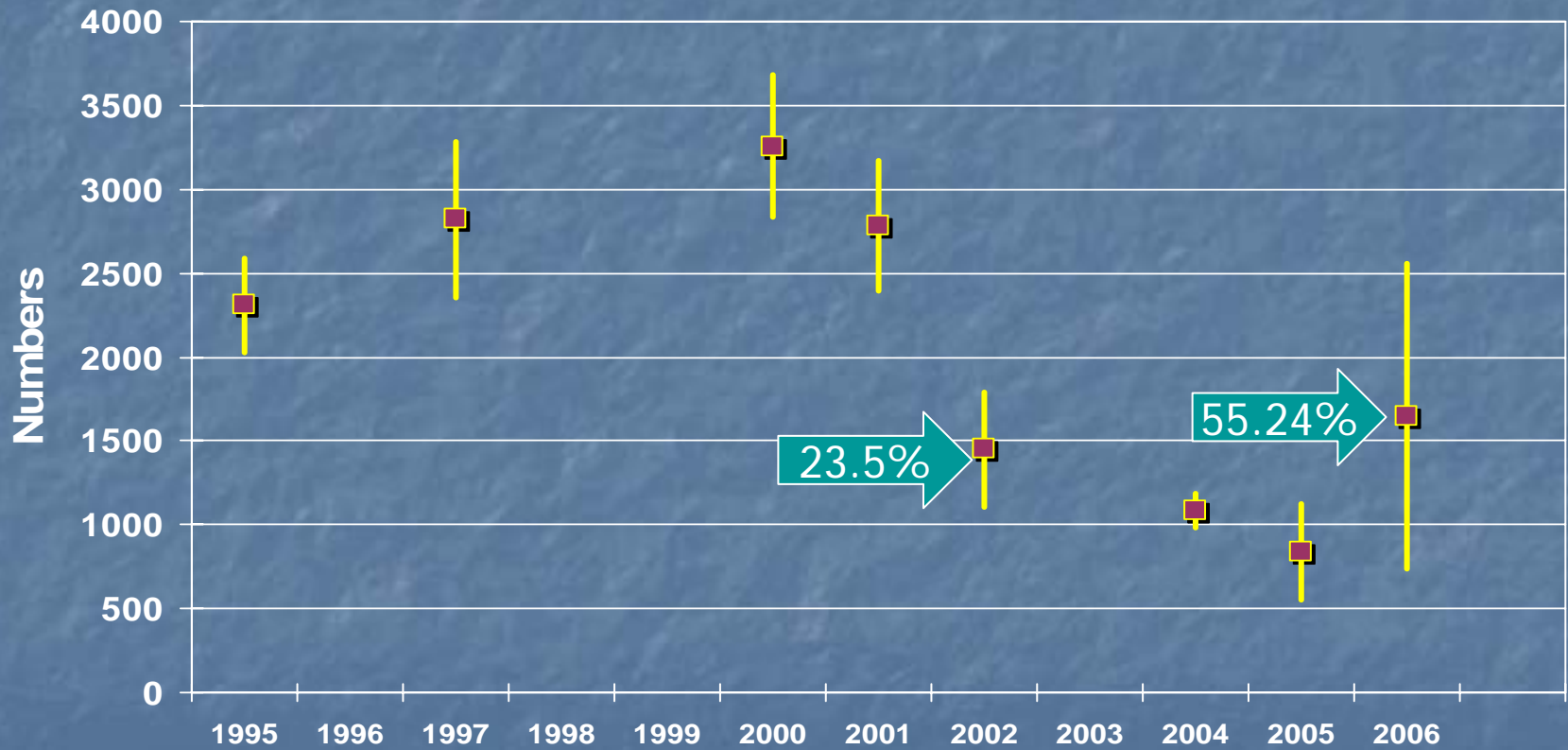
Gemsbok



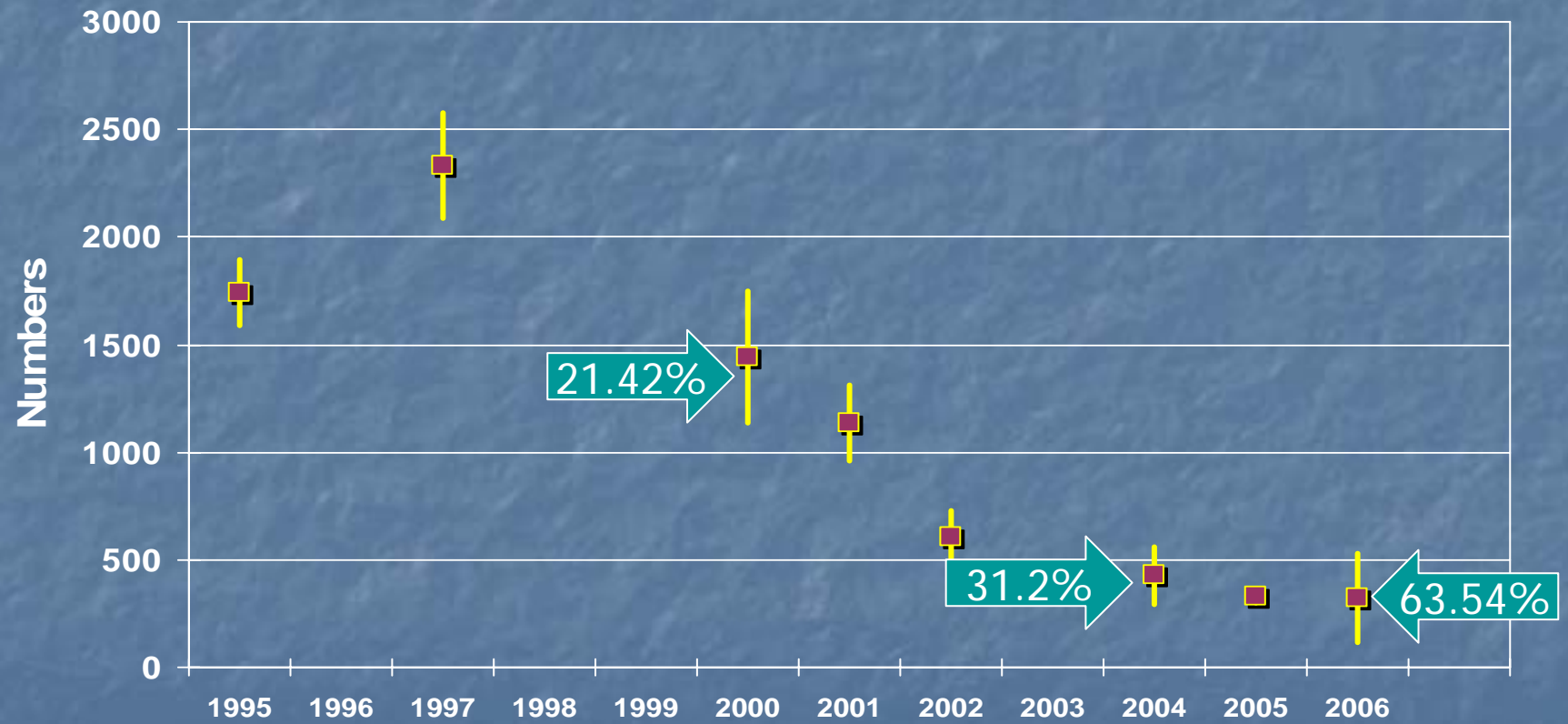
Hartebeest



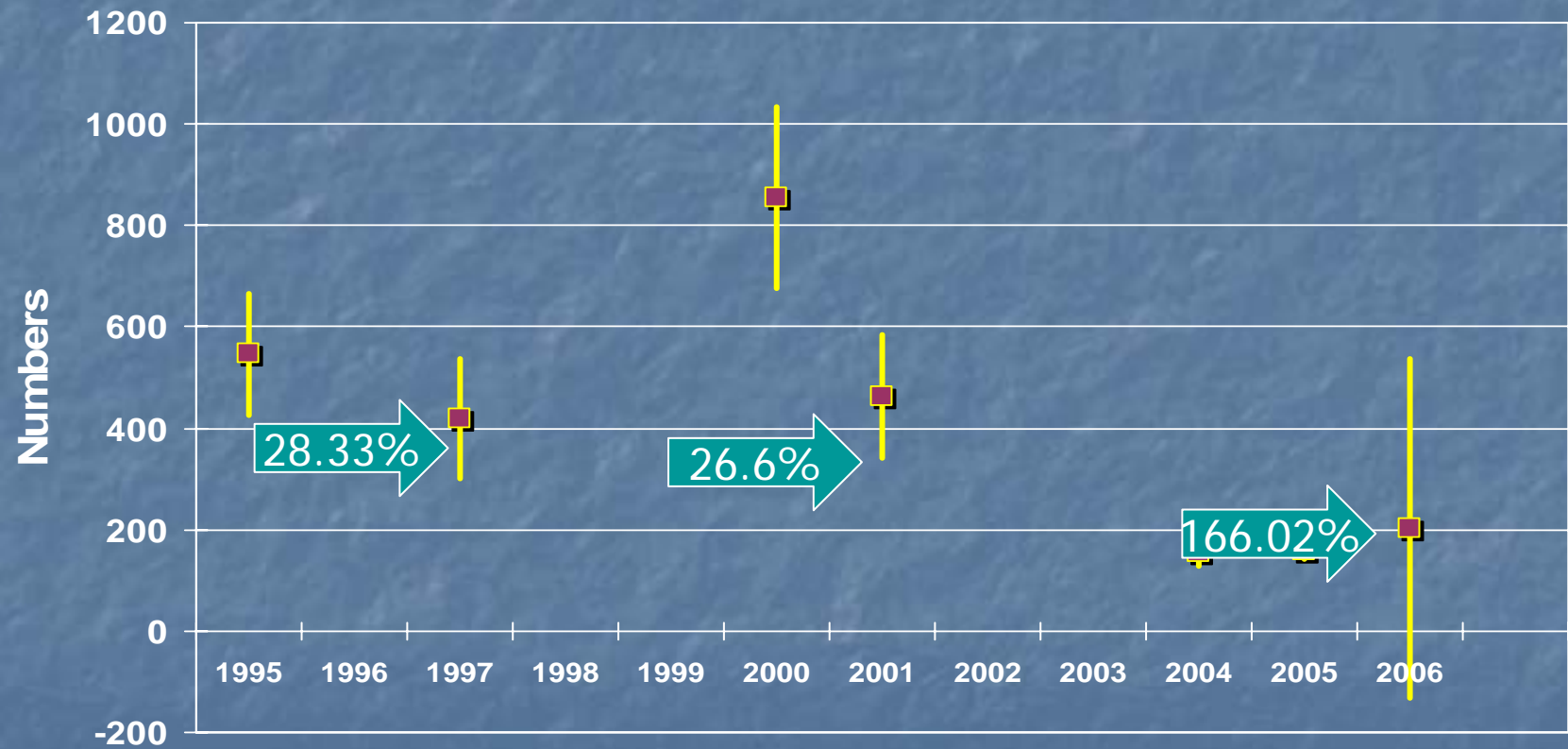
Impala



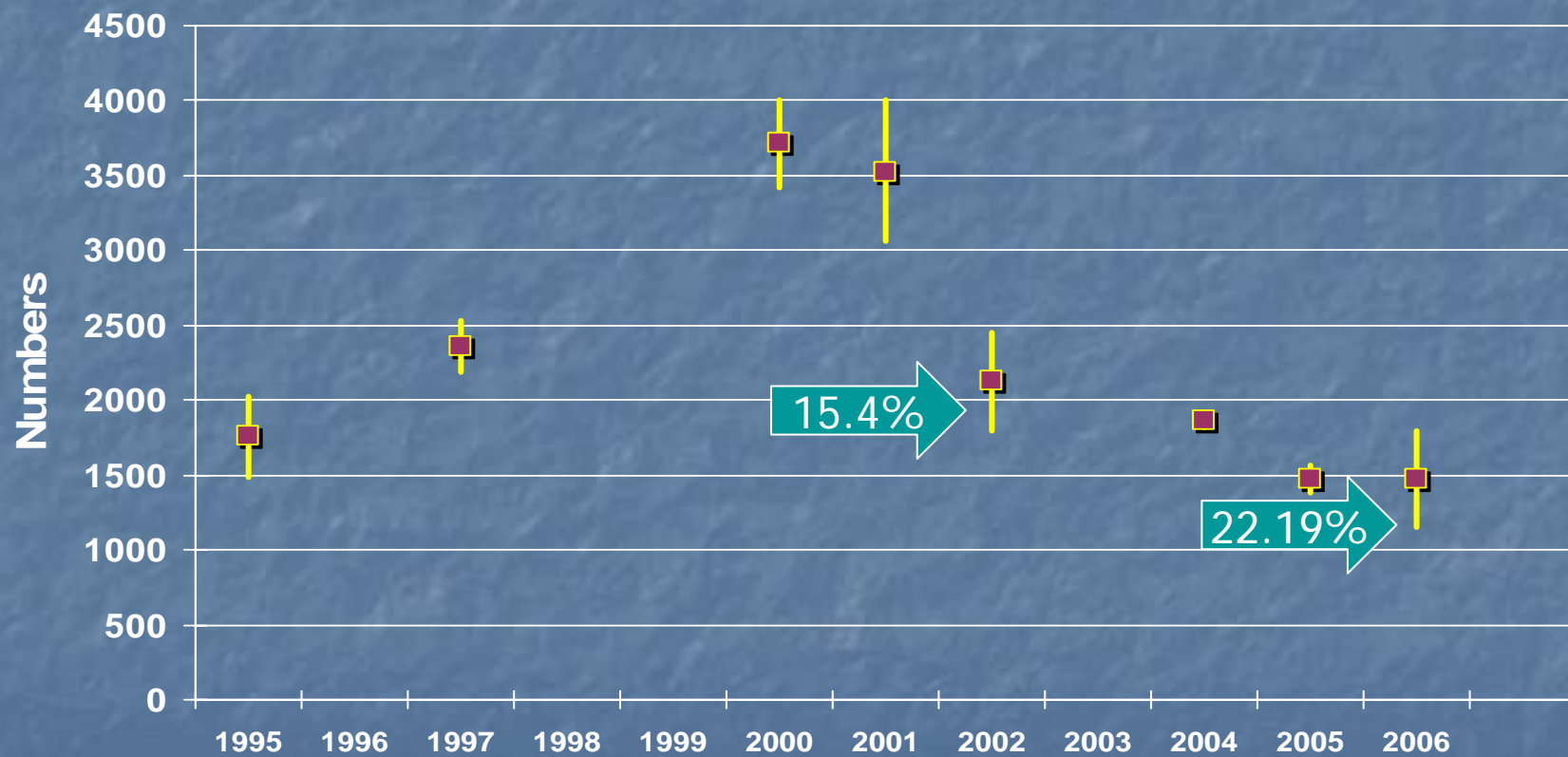
Kudu



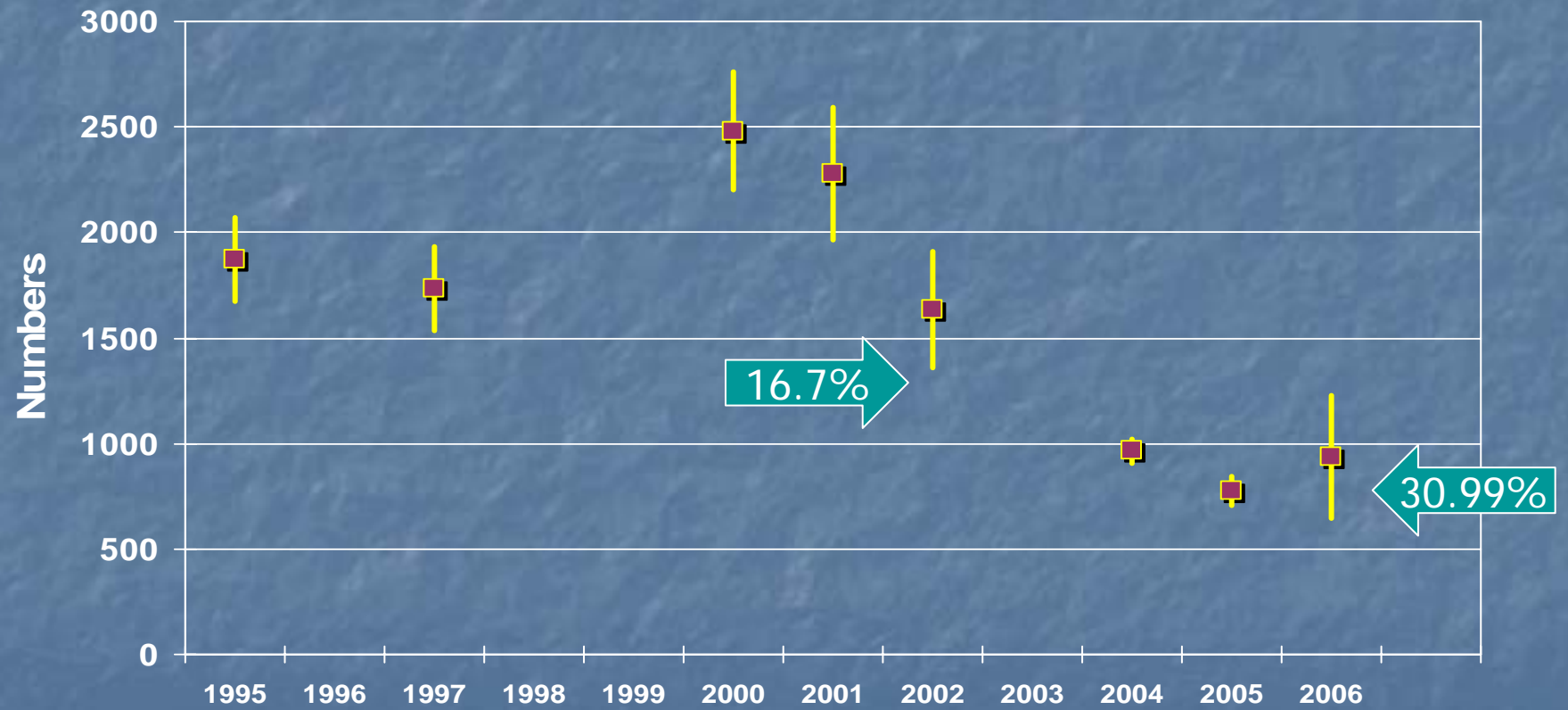
Waterbuck



Wildebeest

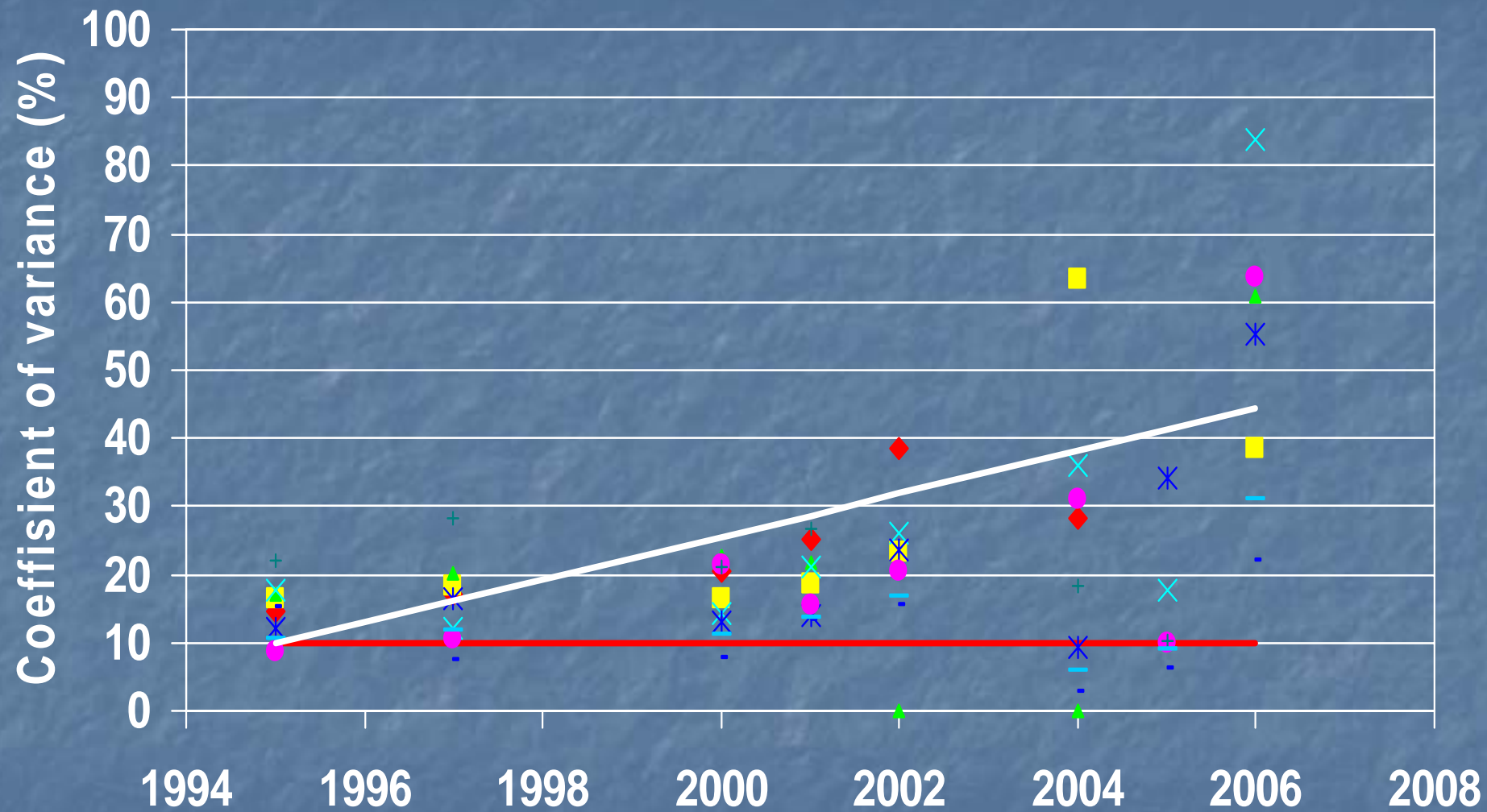


Zebra



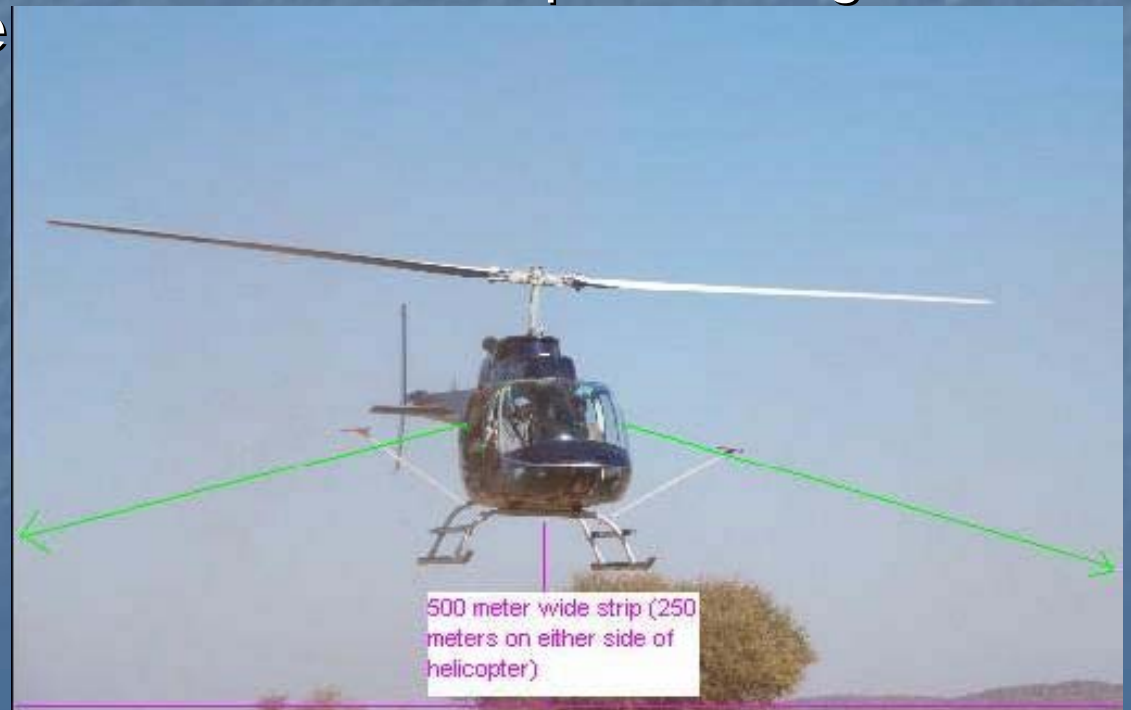
Count objectives

Species	Required coefficient of variance
Eland	<10
Gemsbok	<10
Hartebeest	<10
Impala	<10
Waterbuck	<10
Kudu	<10
Wildebeest	<10
Zebra	<10

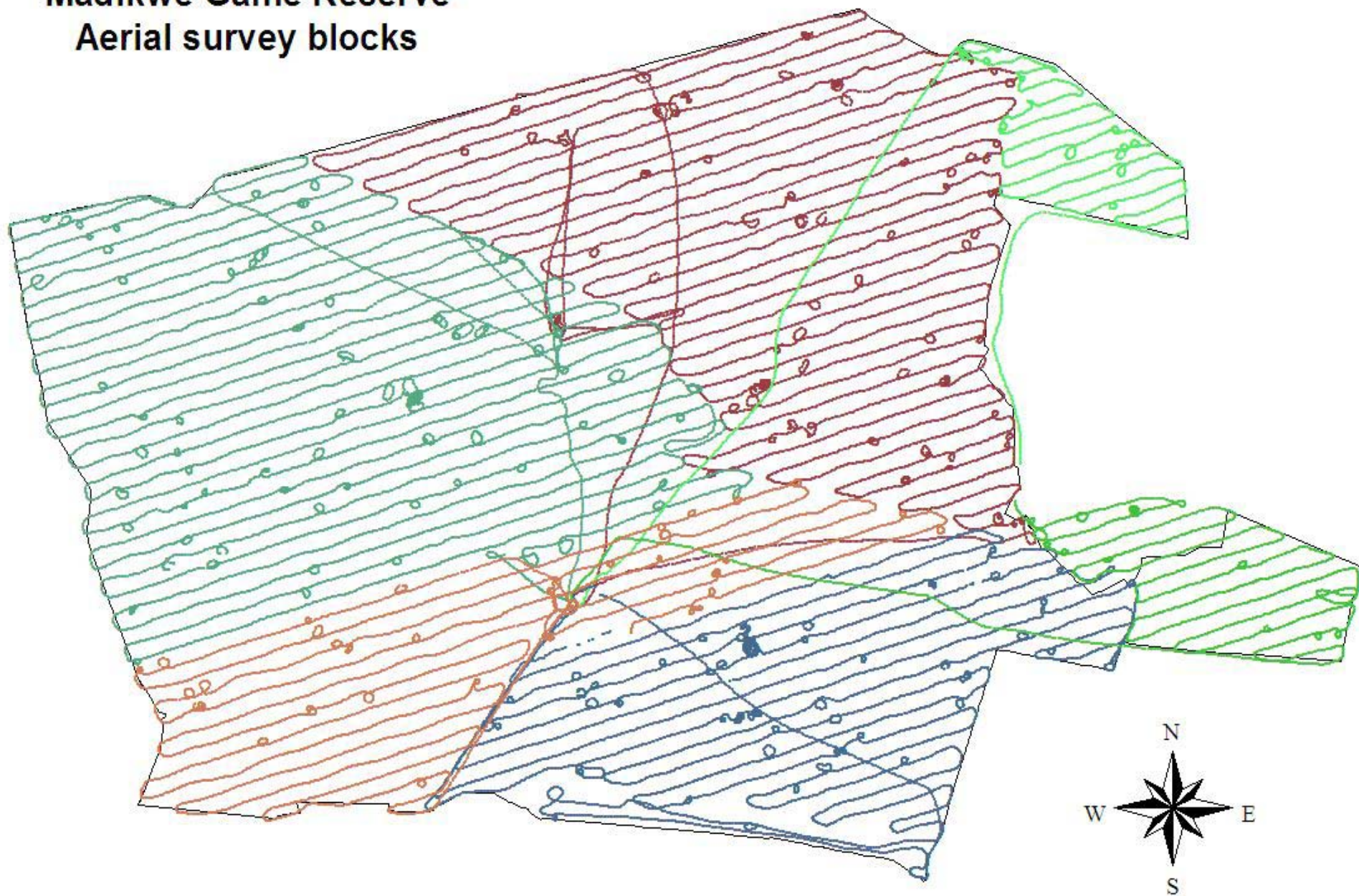


Methodology

- During July/August 2007, the whole park was surveyed
- Three replicate counts were conducted on consecutive days from a 4seater helicopter with doors removed
- Struts were mounted on either side of helicopter to produce a swath width of 250m ~ total strip width of 500m
- Data were recorded on an on-board computer using "Capture ©" software



Madikwe Game Reserve Aerial survey blocks



- From these precision for the various species were calculated. Precision of the counts is expressed as a coefficient of variation (scaled measure of dispersion that allows for comparison between sites), i.e.

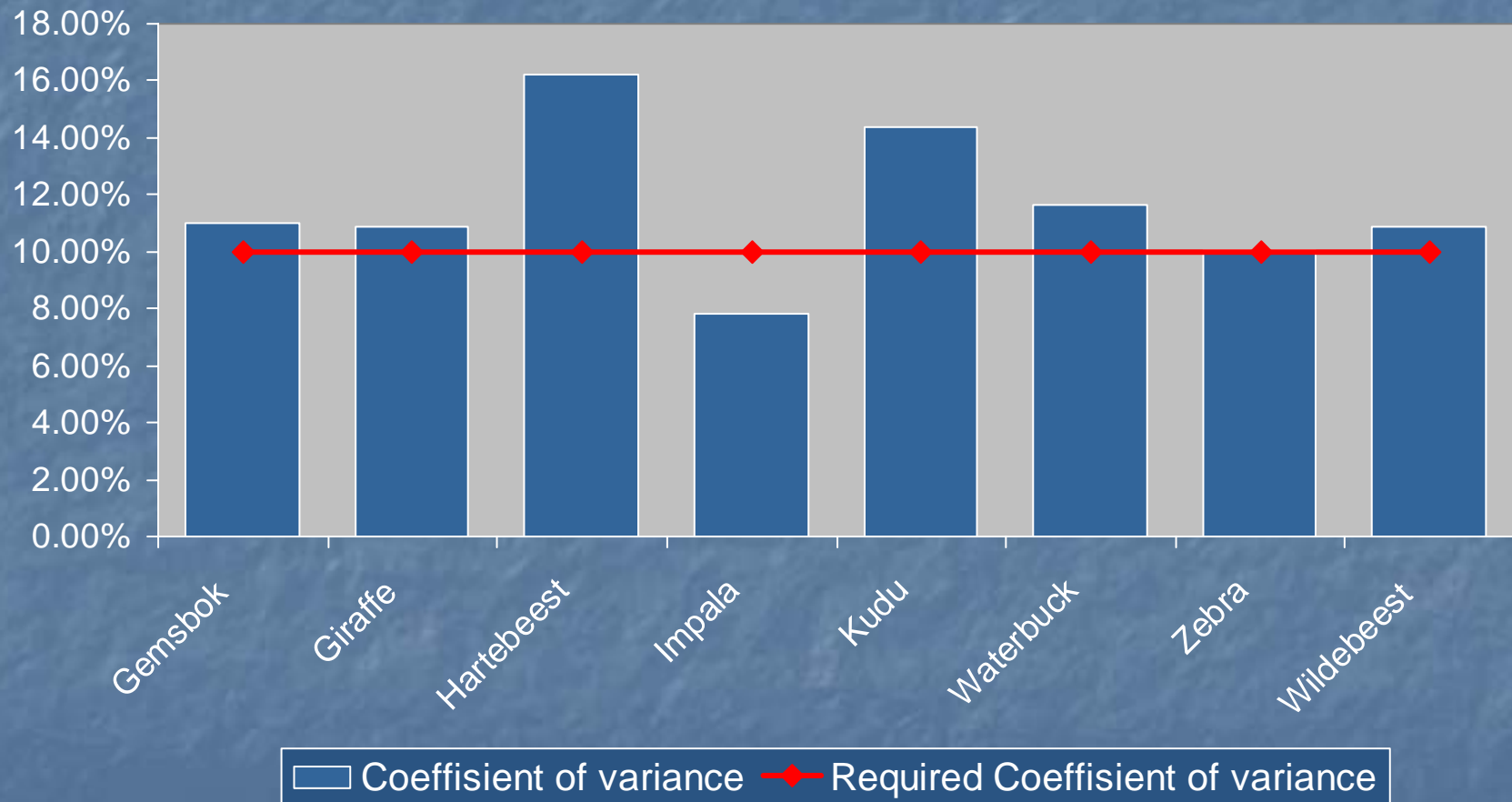
$$\frac{s}{\bar{x}} \times 100$$

- where s : sample standard deviation
- and the \bar{x} : mean of the replicate counts.

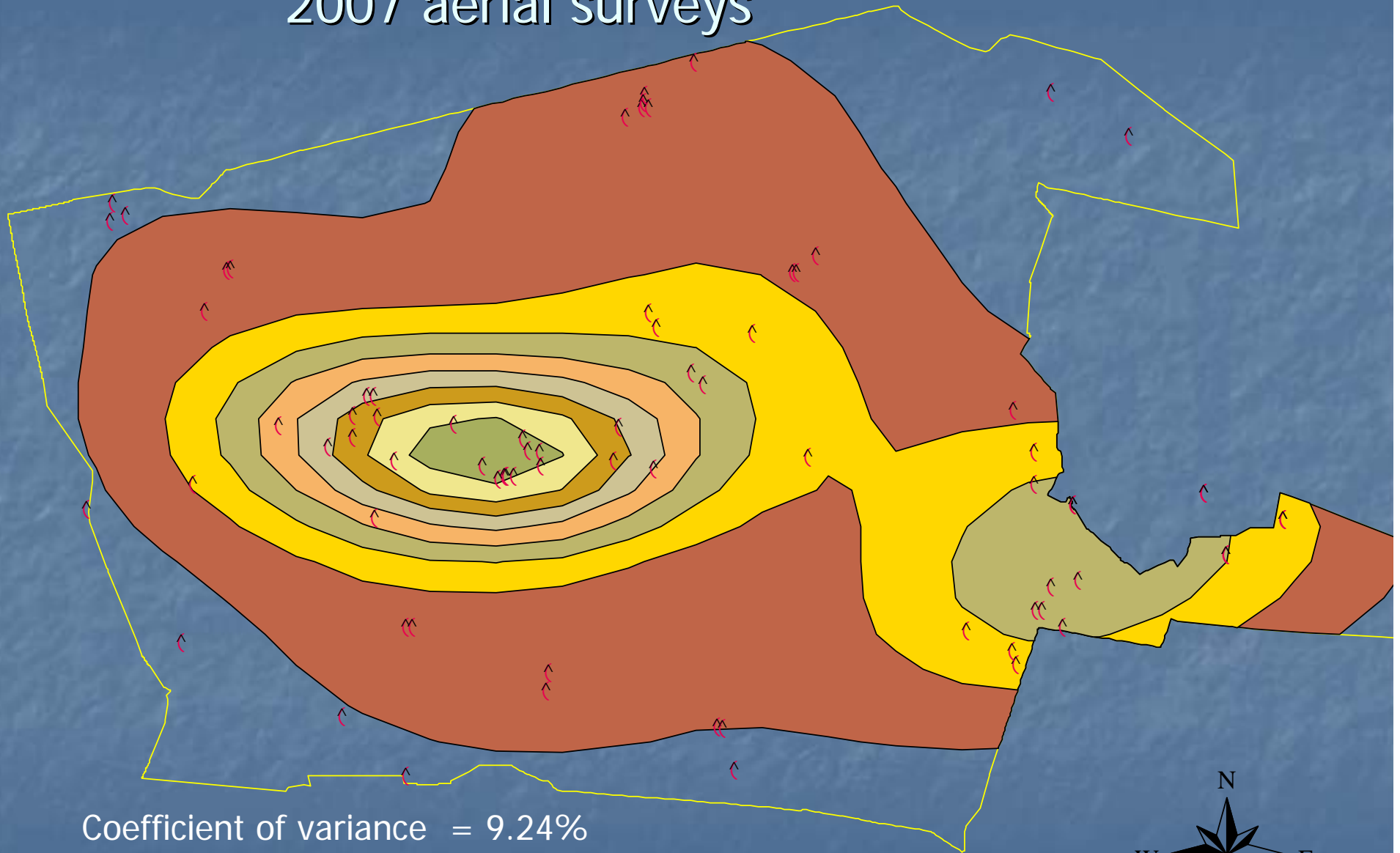
Results

SPECIES	1st replicate	2nd replicate	3rd replicate	Mean	Coefficient of variance
IMPALA	2129	2309	2568	2335	7.82%
ZEBRA	950	1216	1071	1079	10.04%
GEMSBOK	91	119	102	104	10.98%
GIRAFFE	135	154	118	136	10.85%
WATERBUCK	101	132	108	114	11.67%
KUDU	324	467	411	401	14.39%
HARTEBEEST	82	96	123	100	16.95%
WILDEBEEST	1469	1874	1534	16261	10.90
TSESSEBE	5	24	8	12	67.14%

Results



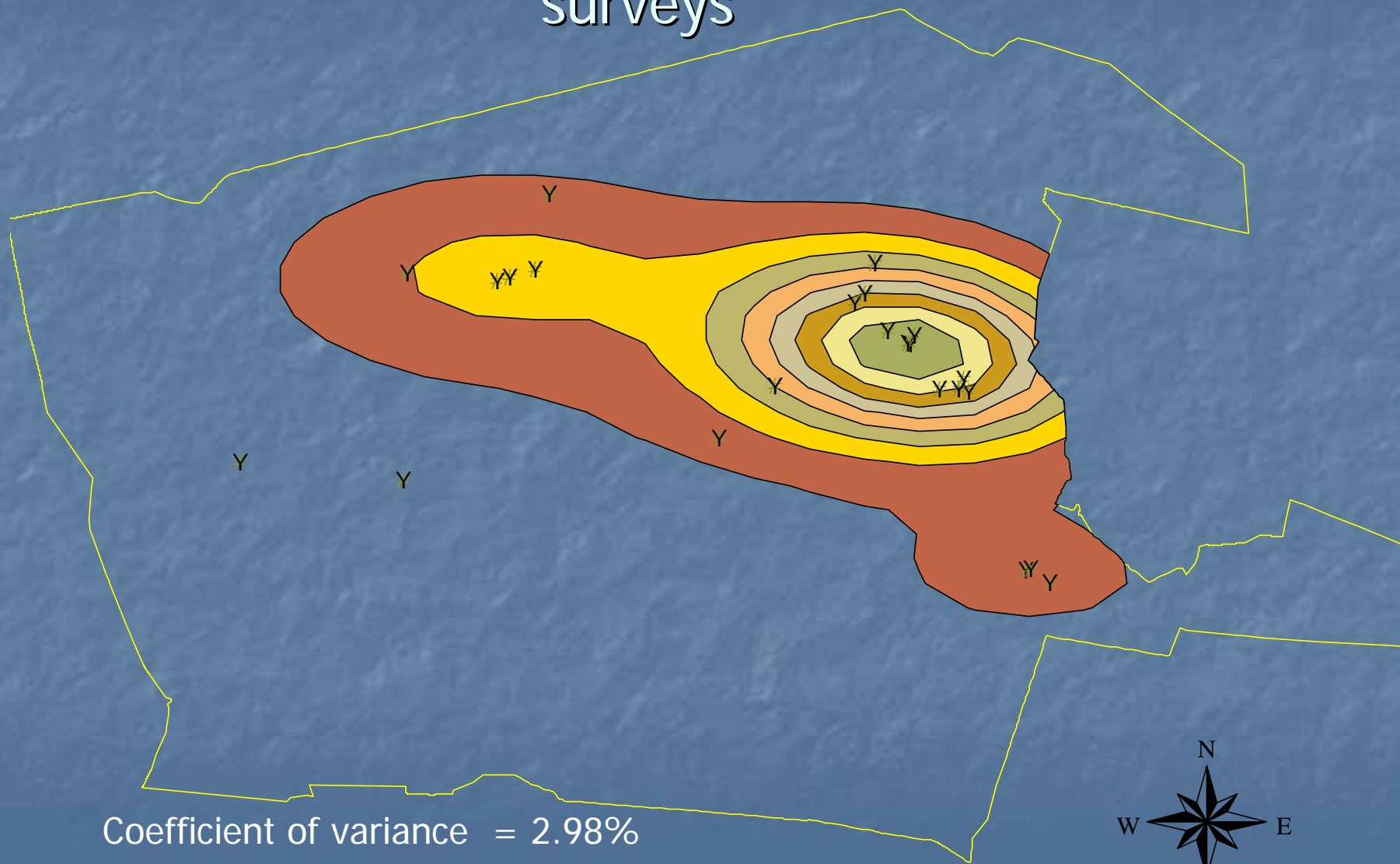
Madikwe elephant distribution during 2007 aerial surveys



Coefficient of variance = 9.24%



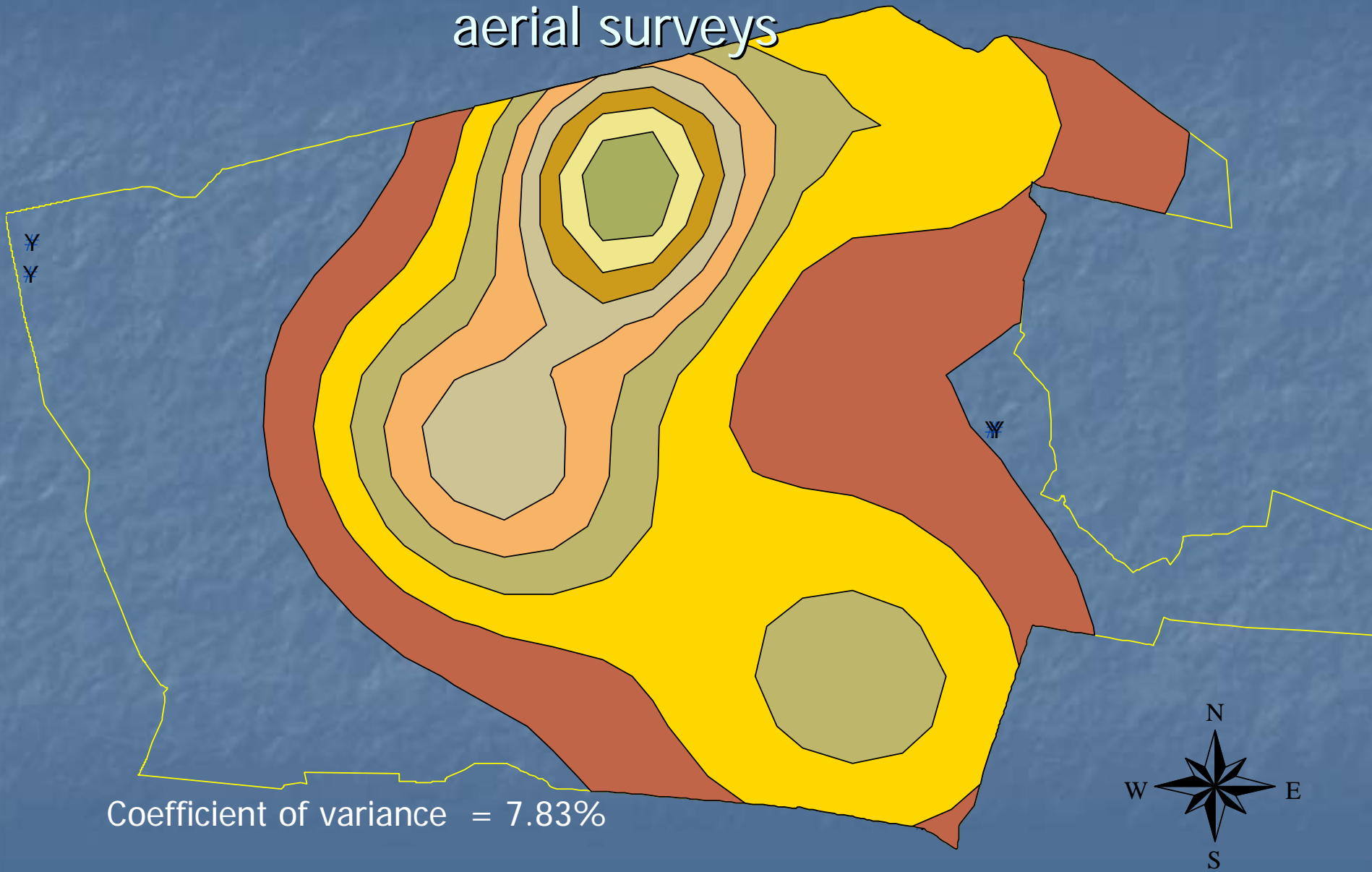
Madikwe buffalo distribution during 2007 aerial surveys



Coefficient of variance = 2.98%



Madikwe white rhino distribution during 2007 aerial surveys



Coefficient of variance = 7.83%

Discussion

- So, why did the distance estimates not provided us with the desired CoV's
 - Complexity of the technique
 - Not sufficient sightings
- It is evident from the results of experimental surveys of 2004, 2005 & 2006 that neither the high/low game density replicates nor the 33% replicates on Madikwe could provide enough data for reliable estimation of technique precision
- When replicates counts are conducted of subsections of a sample area in order to estimate precision, these replications are done with the following assumptions:
 - Wildlife is stationary and non-mobile and will therefore be encountered in the same place during each replication.
 - Wildlife is homogenously and non-randomly distributed over the sample area.
 - Wildlife occurs in high densities.
- These requirements are not met in Madikwe and the result is evident in the poor precision results when sampling

Conclusions

- With the total area count, replicated three times, we could achieve an acceptable CoV, even for some of the HVS
- The CoV can be seen as a valuable guide in that a CoV value less than the population change (%) to be detected increases the probability of showing real change over time
- A CoV that exceeds percentage change to be detected increases the probability of the change shown having actually not taken place in reality.
- Single-pass aerial surveys that are unreplicated or lacking in a strategy to estimate precision cannot fulfill the role of decision support in this regard.
- Again showed that consistency in technique is absolutely crucial in obtaining acceptable precision levels

Acknowledgements

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