



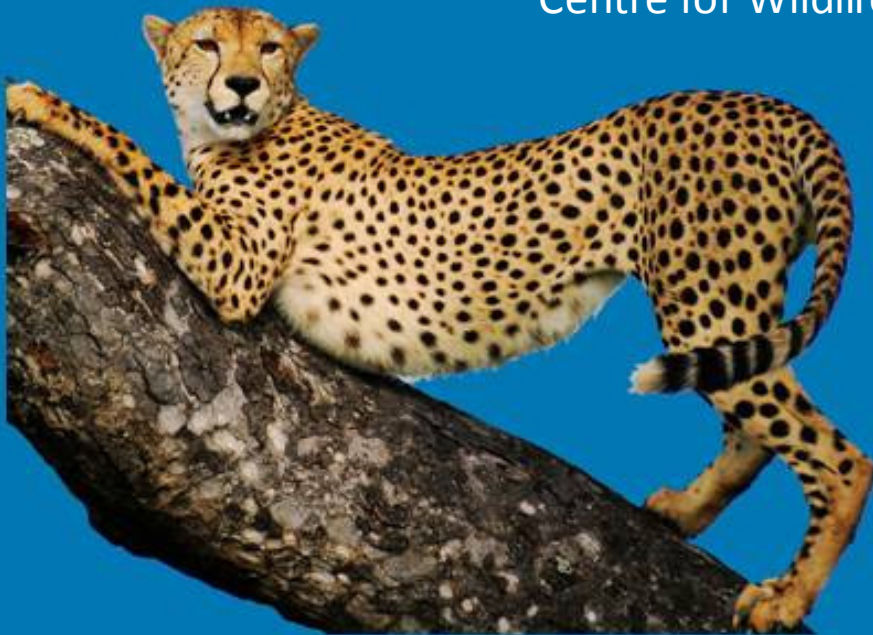
WHICH SPOTS MATTER?

Using Ecological Niche Modelling to Investigate Habitat Suitability
for Cheetahs in South Africa

Kelly Marnewick^{1,2}, & Michael Somers²

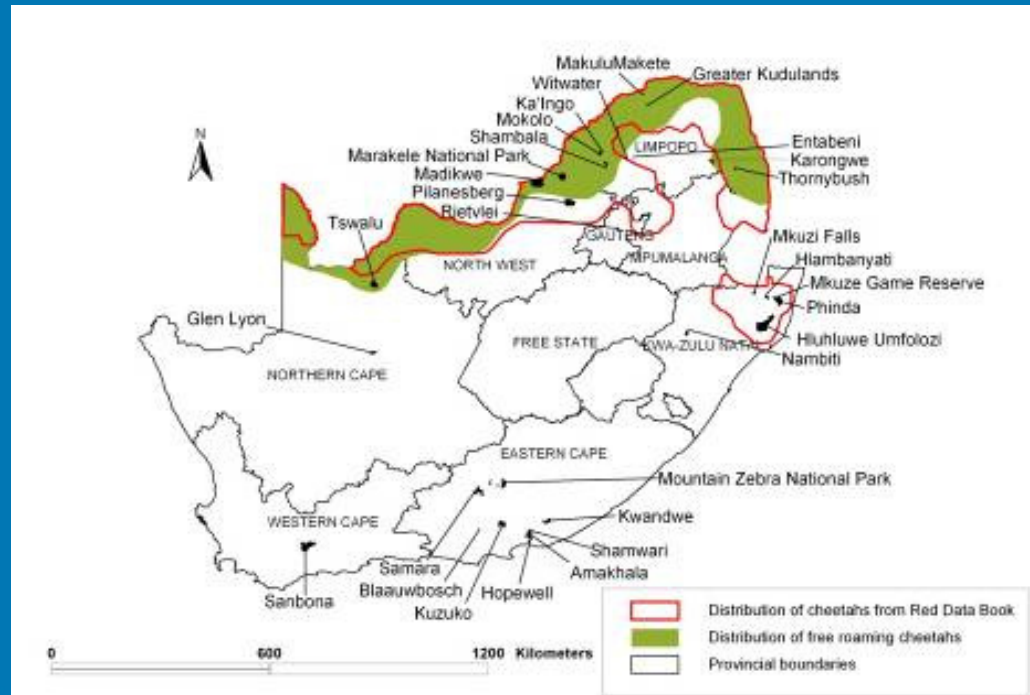
¹ Carnivore Conservation Programme, Endangered Wildlife Trust

² Centre for Wildlife Management, University of Pretoria



INTRODUCTION

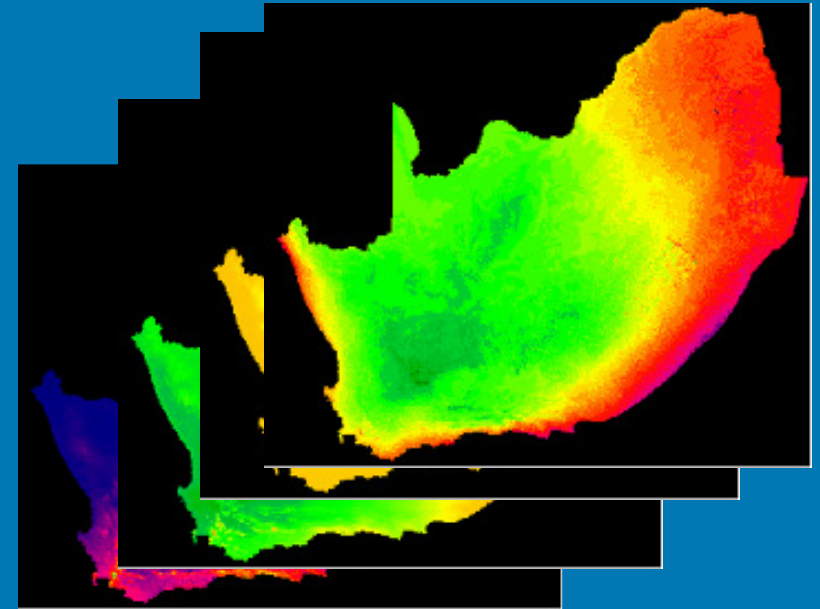
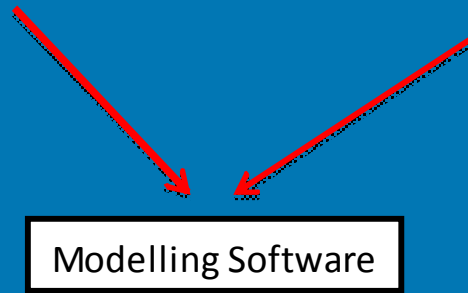
- ❖ Cheetahs occur: Kruger National Park, Kgalagadi and northern border of SA on ranchlands
- ❖ Re-introduced to fenced protected areas
- ❖ Not known how much habitat is suitable for cheetahs in SA and what is limiting to distribution



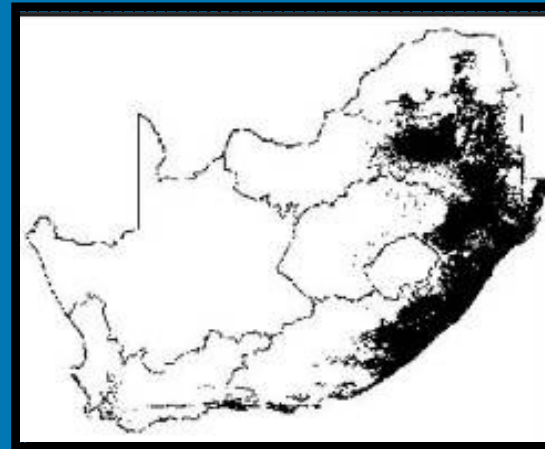
MAXIMUM ENTROPY MODELLING THE CORRELATIVE APPROACH



Distribution records



Predictor / environmental variables



Potential distribution

INPUT DATA

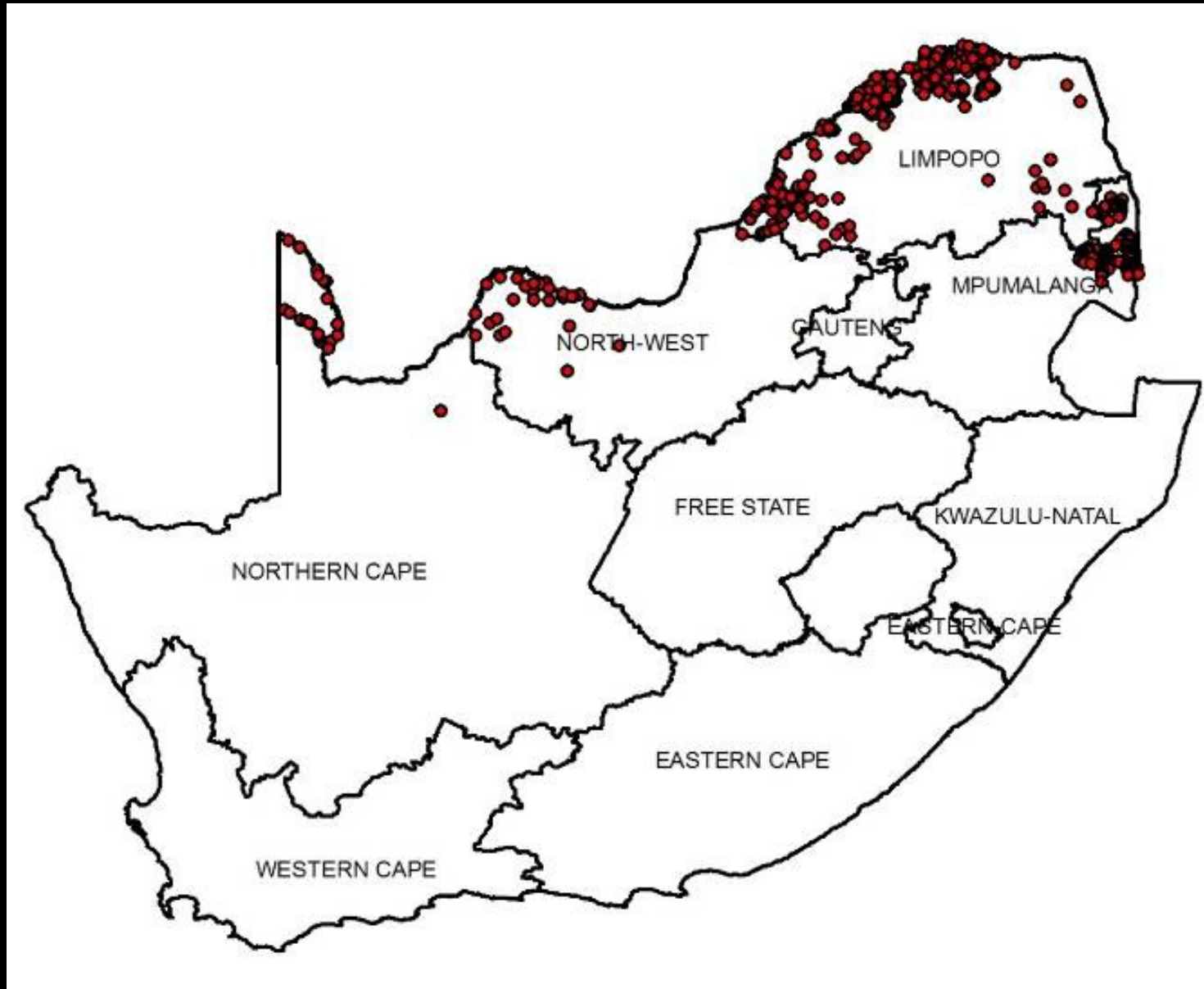
DISTRIBUTION RECORDS FOR CHEETAHS IN SOUTH AFRICA

- 🐾 Ranchland
 - Questionnaire surveys
 - 'Problem animal' removals
- 🐾 Kruger National Park & Kgalagadi
 - Tourist sightings
- 🐾 Relocated populations
 - Not included



INPUT DATA

DISTRIBUTION RECORDS FOR CHEETAHS IN SOUTH AFRICA



INPUT DATA

PREDICTOR VARIABLES (ENVIRONMENTAL VARIABLES)

Predictor variables (Environmental variables)

- Vegetation (SANBI, Vegetation Map 2006)
- Human Density (Census data, CSIR FUNDISA Disk)
- Digital Elevation Model, DEM (CSIR FUNDISA Disk)
- National Land Cover NLC 2000 (CSIR/ARC)
- Mean Annual Precipitation (SANBI)
- Modis Tree Cover (CSIR / FUNDISA Disk)
- Primary Productivity (CSIR)
- Human Impact Index (Last of the Wild, WCS/CIESIN)



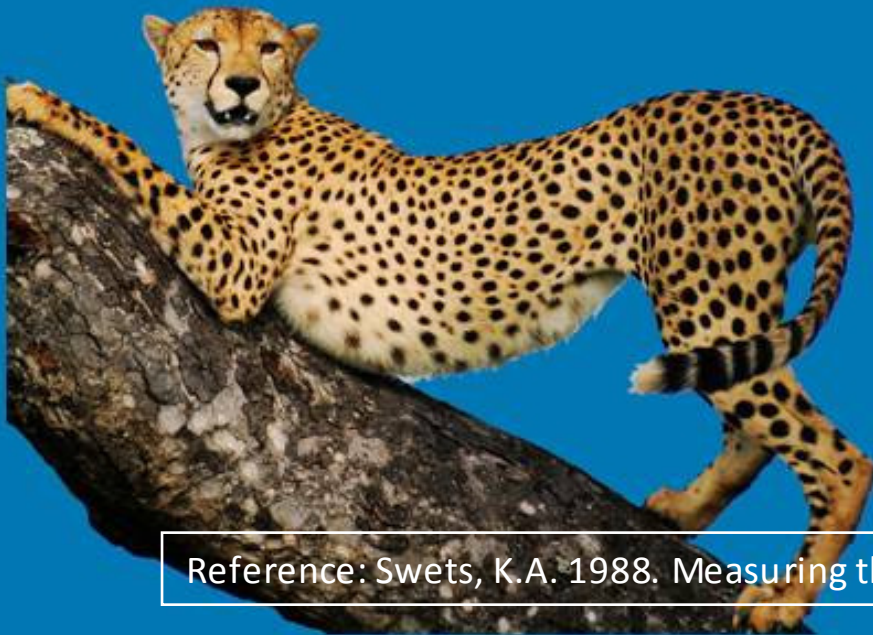
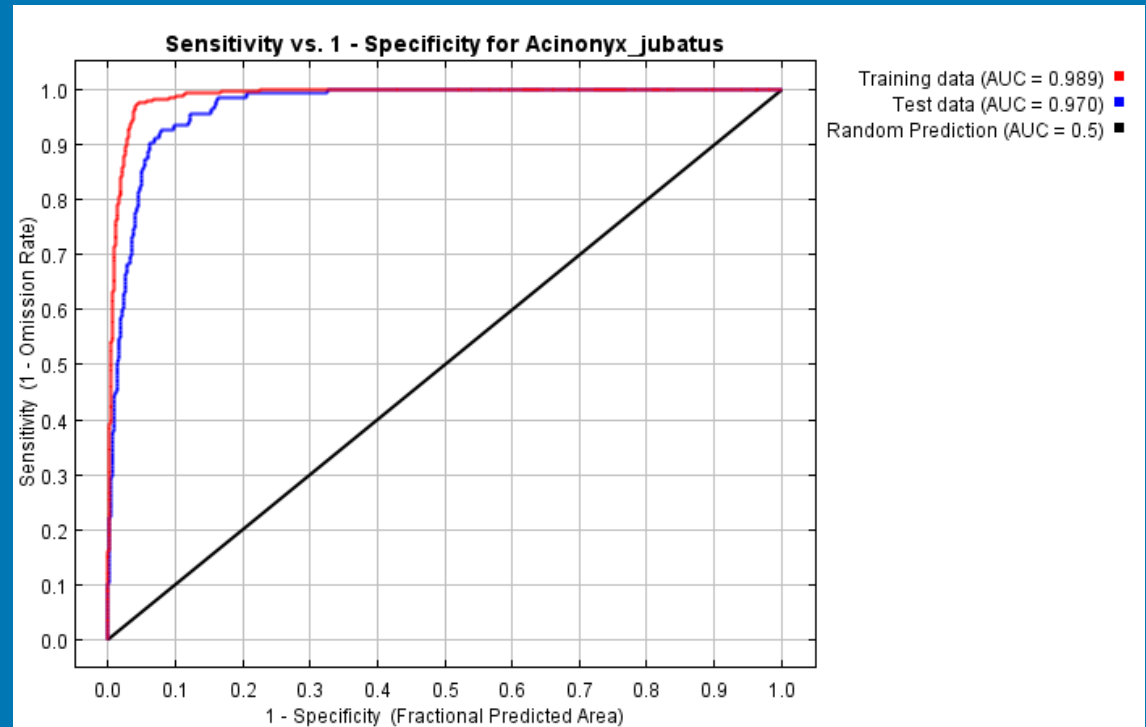
Other inputs:

- Training (calibrating) data
Calibrates the model
- Testing (evaluating) data
Compares with model predictions
 - Used a random selection of 30% of the event data

RESULTS

Receiver Operator Curve (ROC)

AUC=Area Under Curve
Measure of performance of model
(Swets 1988)



<0.5	no better than random
0.5-0.7	poor
0.7-0.9	useful
>0.9	excellent

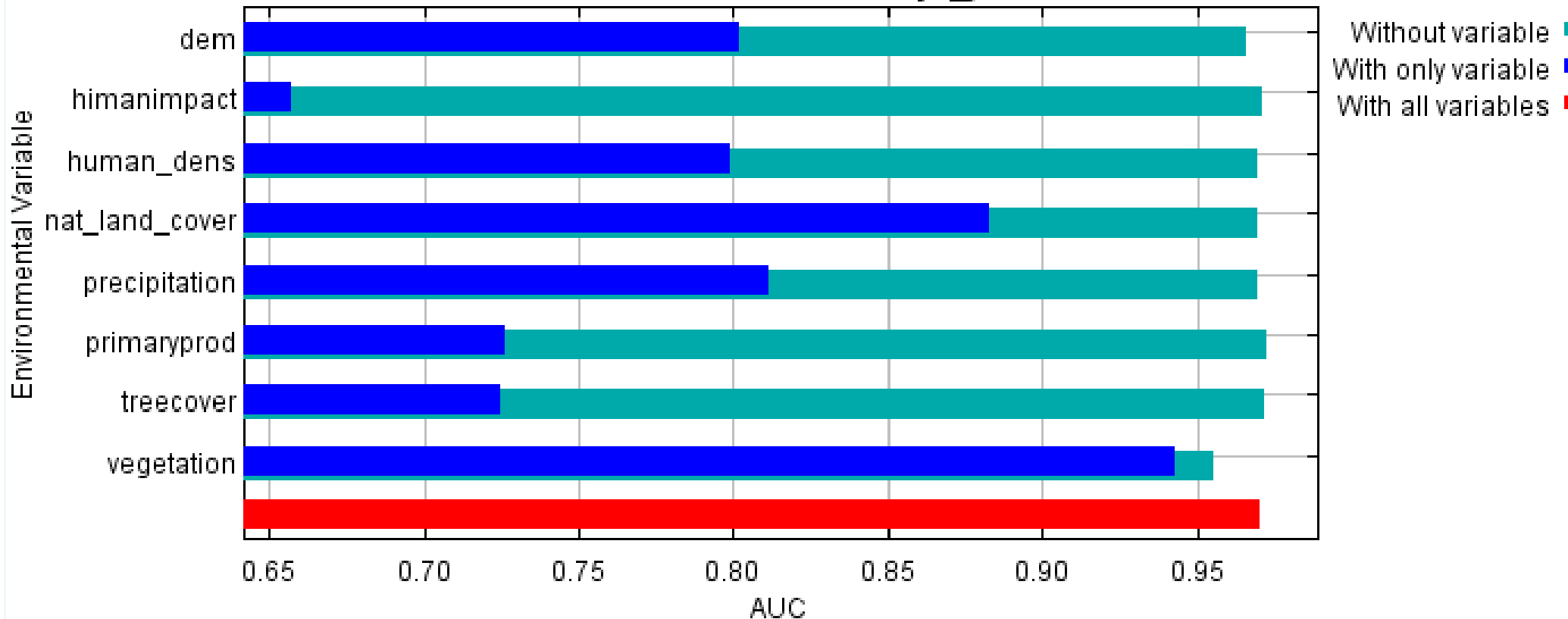
Reference: Swets, K.A. 1988. Measuring the accuracy of diagnostic systems. *Science* 240: 1285-1293

RESULTS

- The environmental variable with highest gain when used in isolation is vegetation
- i.e. Vegetation has the most useful information by itself.

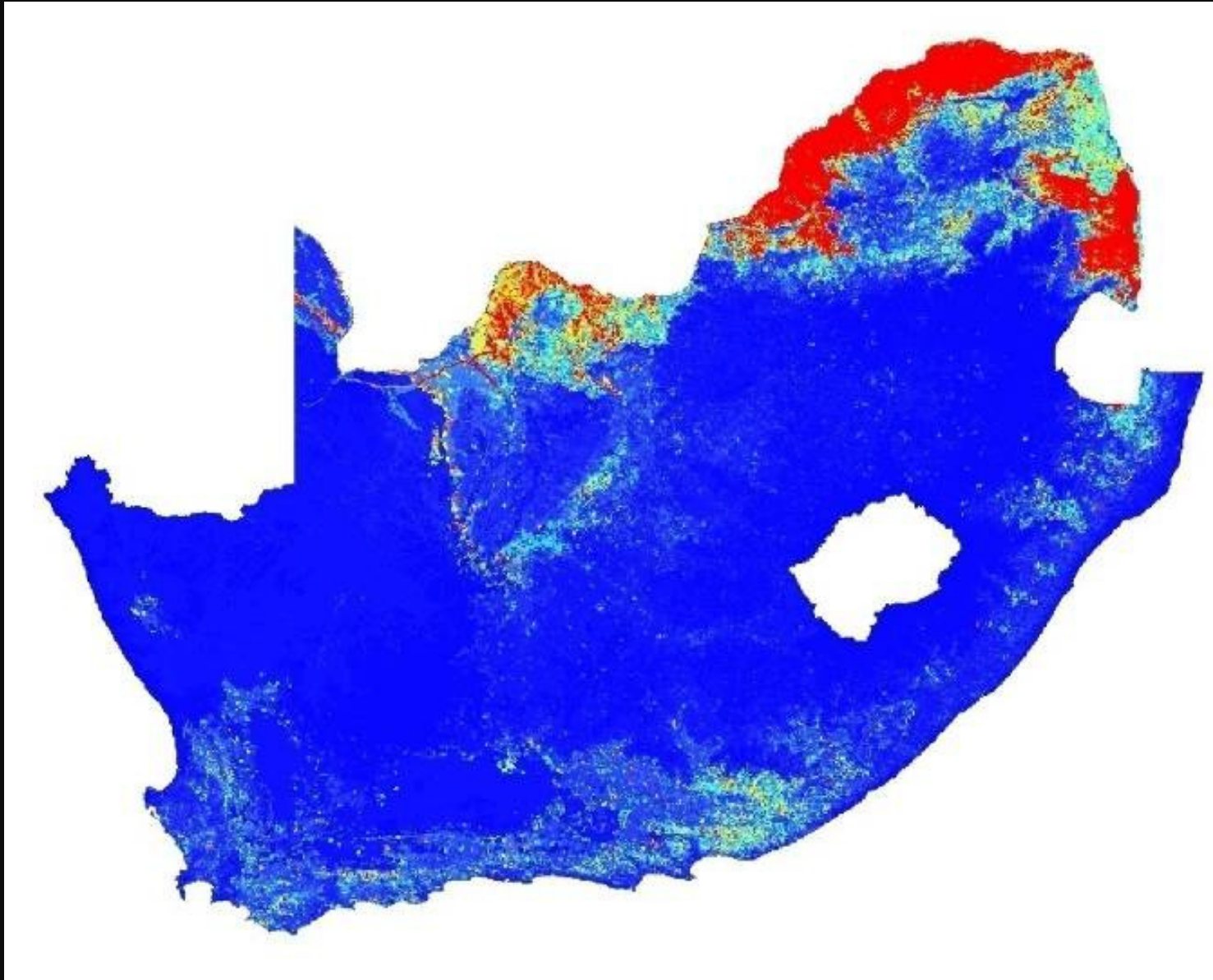
- The environmental variable that decreases the gain the most when it is omitted is vegetation,
- i.e. Vegetation has the most information that isn't present in the other variables.

Jackknife of AUC for *Acinonyx jubatus*



RESULTS

Map representing results from MaxEnt modelling



CONCLUSIONS

- Need environmental predictor for vegetation structure
- MaxEnt accurately represents cheetah distribution in SA
- Cheetahs occur in most suitable habitat in SA
- There is suitable habitat for cheetah range expansion



ACKNOWLEDGEMENTS

ADDITIONAL FIELD SURVEYS

- 🐾 Peter Lindsey: Limpopo
- 🐾 Michelle Thorn: North West
- 🐾 KNP: EWT cheetah census
- 🐾 Kgalagadi: Gus Mills

MODELLING

- 🐾 EWT/SANBI ENM Workshop



Thank you.