



*Black Harriers: ecology, threats & conservation*

*Dr Odette Curtis-Scott & Dr Rob Simmons*

## What we know.... 23 years of research

Ecology/Life History	
Size	340 – 600 g
Endemic?	South(ern) Africa
Population size	1300 birds (declining 2.3% annually)
Evolutionary Origin	from Pallid Harrier
Time?	1.5 to 1.7 million ya
Conservation Status	Endangered
Threats	Habitat loss, wind farms no genetic variation, climate change
Habitat: breeding	Scrub (Fynbos, Strandveld, Karoo & Renosterveld) and grassland
Habitat: foraging	Scrub, grassland & croplands



## Questions asked over the last 20 years

- In which habitats are harriers most productive?  
*[coastal habitats and lowland renosterveld remnants in the Overberg (>100 ha) exhibit longer breeding seasons (8 mo) and higher productivity than montane areas (5 mo)]*
- What factors lead to higher productivity?  
*[higher rainfall and low temperatures increase availability of mice]*
- Where do adults go when they finish breeding?
- What are the main anthropogenic threats?
- What is their genetic status ?
- Is their small population size viable?



Tagging birds since 2002-2016: from Yagi antennae to Argos (12.5 g) satellite tags...



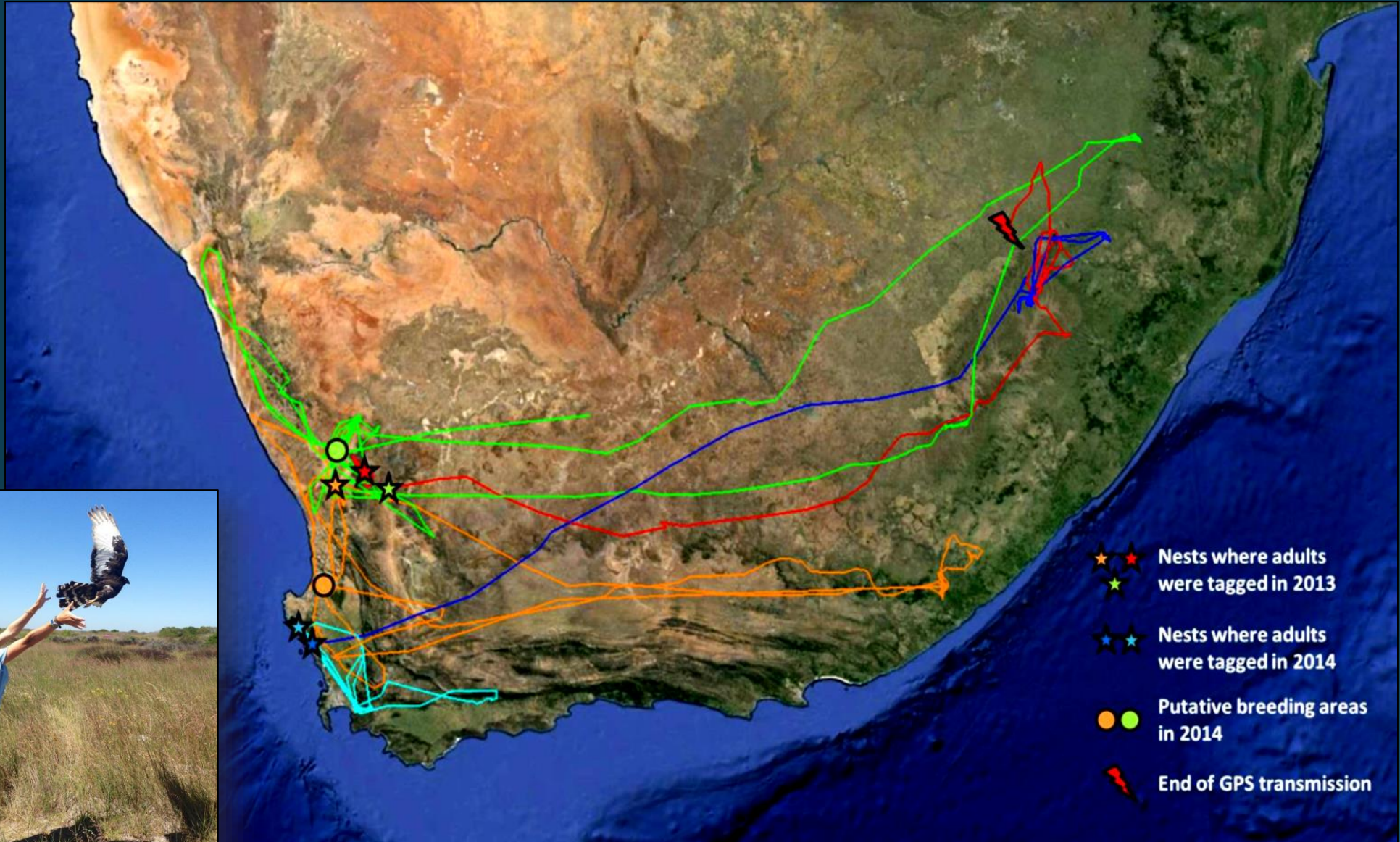
VHF transmitters



... to GPS/GSM tags (9g) 2020-present



# Migration routes: what have the Argos trackers revealed?



Dr Sophie Garcia

5/25/2011

# Moraea's track to and from Lesotho: Jan-April-Sept 2011



Summers in Sani Feb-Apr 2011



6 Aug heads back via Somerset E to Aberdeen (700 km total) where signal lost Sept 2011

Passes through Aberdeen back through Somerset E, to Engcobo 31 July (540 km)

Moraea heads to Lesotho from WCNP Feb 2011 (1000 k/4 d)

Mid April 2011: moves south from Lesotho  
Early July: visits Engcobo then Somerset East before flying back across Karoo (1240km in 6 d)

20 July brief visits Langebaan but flies on immediately NE to mountains and by 21 July back at Beaufort West (260 km)

US Dept of State Geographer  
SIO, NOAA, U.S. Navy, NGA, GE  
Image © 2011 GeoEye  
© 2011 Europa Technologies



and then (Jan 2012) migrates back to Lesotho!

After travelling 5820 km in 6 months since leaving breeding grounds in Langebaan, Moraea found breeding successfully in Camdeboo Mts, Sept 2011...

## *When and where do harrier fatalities occur?*

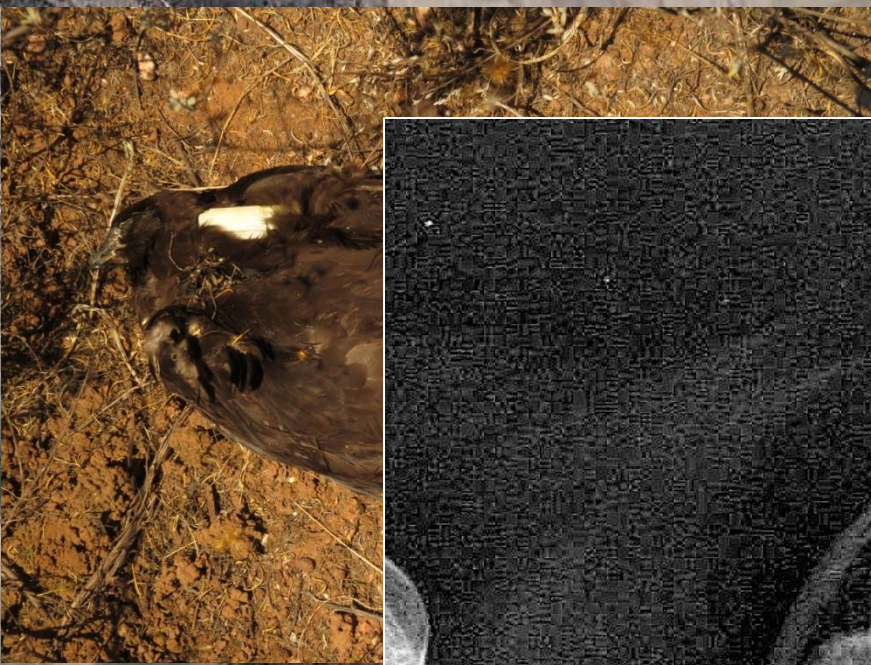
Trackers allow us an insight into mortality not previously possible



- Until 2021 all known fatalities occurred on migration
- Three of 19 tagged birds killed under power lines:
  - First bird (Lockie) tracked migrating 1600 km east from N Cape – to Free State grasslands, found under small reticulation line (2007)
  - Motlanthe – WCNP – male found under transmission lines Berg River area (2013)
  - and Jakkie from Jakkalsfontein on W coast...



- Jakkie – female from Jakkalsfontein killed under transmission lines Piketberg (Jan 2016)



Thus: 3 of 19 tagged birds suspected to be killed by power lines  
(16%)

Research



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Ecology, conservation and global change biology

**Subject Areas:**  
ecology

**Keywords:**

# Population viability assessment of an endangered raptor using detection/non-detection data reveals susceptibility to anthropogenic impacts

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As the demand for carbon-neutral energy sources increases, so does the need to understand the impacts that these technologies have on the environment. Here, we assess the potential consequences of additional mortality on an Endangered raptor recently exposed to wind farms for the first time, the Black Harrier *Circus maurus*, one of the world's rarest harriers. We conduct a population viability assessment using a Bayesian model integrating life-history information and annual reporting rates from detection/non-detection surveys from the South African Bird Atlas Project. Our

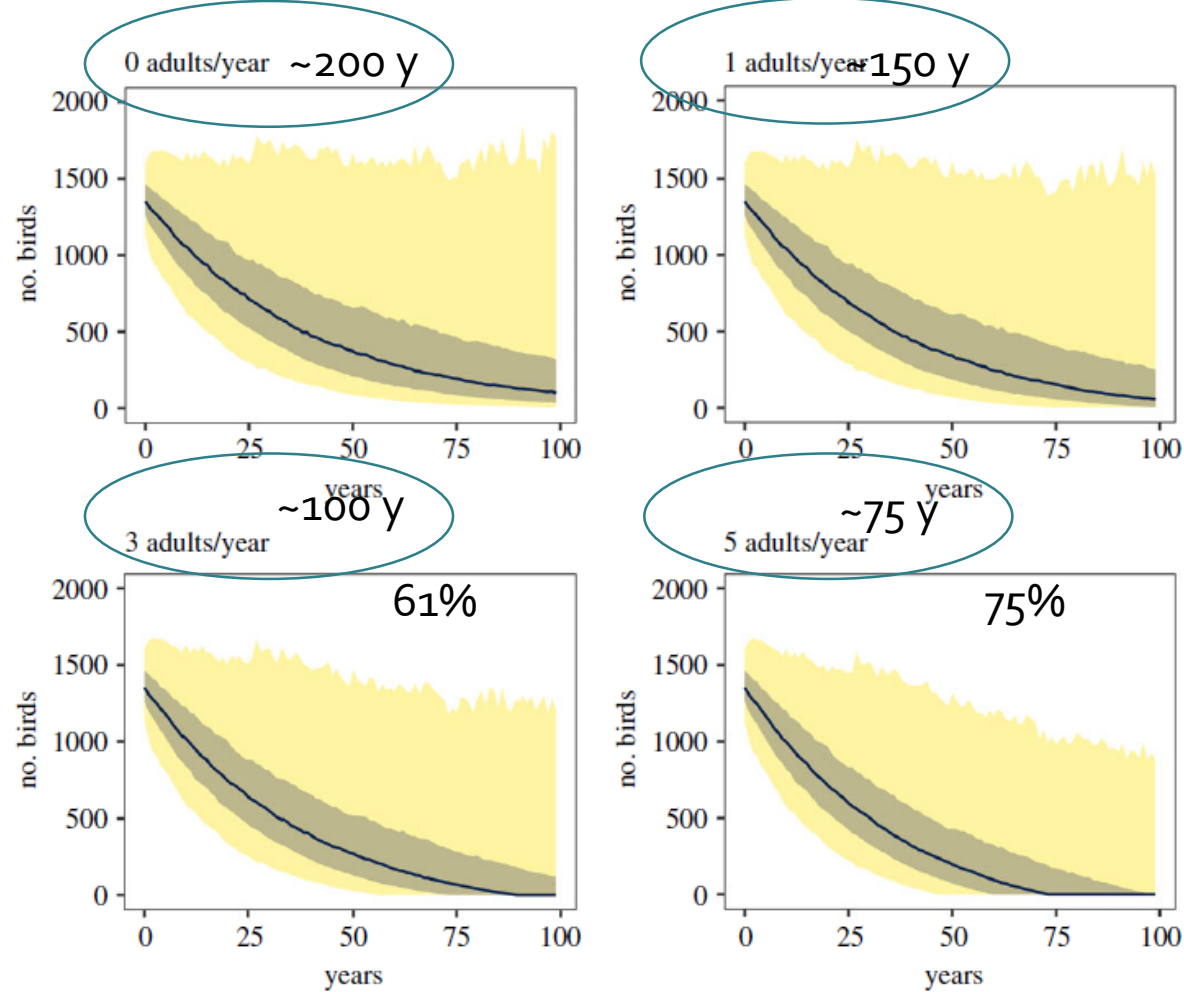
*Effect of increased fatalities on population trends (Cervantes et al. 2022) reveals alarming population trends:*

By modelling bird atlas data (detection/non-detection) over their entire range (2008-2019) we have discovered:

- global BH population **1306 ± 80 individuals**
- By killing **adult birds** we have a greater impact on population numbers than by reducing breeding success or killing youngsters
- Annual decline is 2.3% per year (that alone would lead to extinction in ~200 yrs)



What is the effect of extra deaths of Black Harriers on the long-term population viability of this Endangered species?

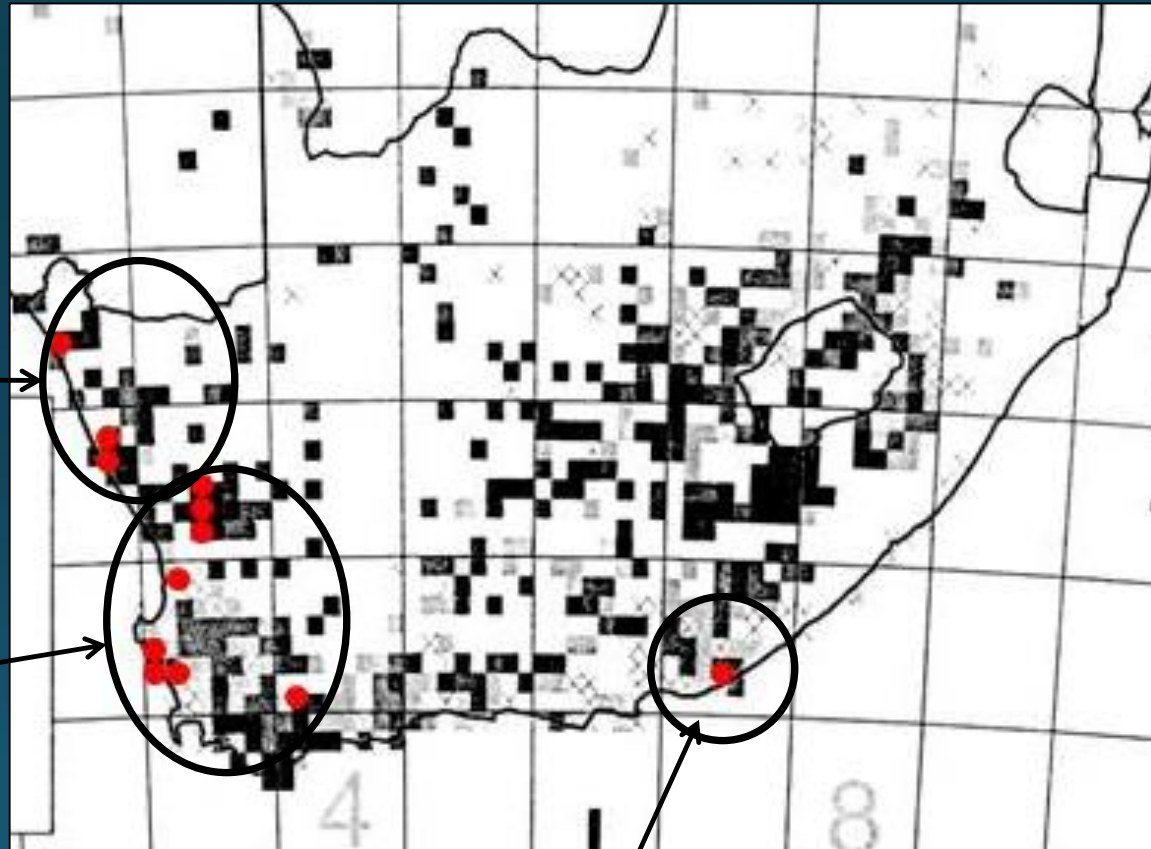


royalsocietypublishing.org/ on 25 February 2022

Figure 4. Distribution of Black Harrier population trajectories simulated from 1000 sets of life-history parameters sampled from the posterior distribution of the population dynamics model and under increasing numbers of adult Black Harrier fatalities per year (0, 1, 3, 5). The solid line represents the mean, and the brown and yellow areas represent the 50% and 90% credible regions, respectively.

*Given the small population is this reflected in their genetic variation?*

Mitochondrial DNA was extracted from moulted feathers from adult breeders across most of the species' range.



Northern Cape  
n = 10 sites

Western Cape  
n = 32 sites

Eastern Cape, n = 3 sites

## Genetic Results:

In the Mitochondria....

- **No variation detected at all** (only one haplotype) in complete mitochondrial ATP6 (684 base pairs) and partial CO3 sequence from 50 individuals collected in 13 sites

In the nuclear genome...

- Screening autosomal VIM intron-8 (527 base pairs), and the Z-linked BRM intron-15 (350 base pairs), from 10 individuals from four sites **showed no polymorphism**



### Is this low genetic variation of concern?

- Need more samples to confirm this
- other raptors (e.g. Madagascar Fish Eagle) show no variation, and no in-breeding effects.
- Should climate change require significant adaptation (hotter or drier future),  
BH may not have the tools to adapt.

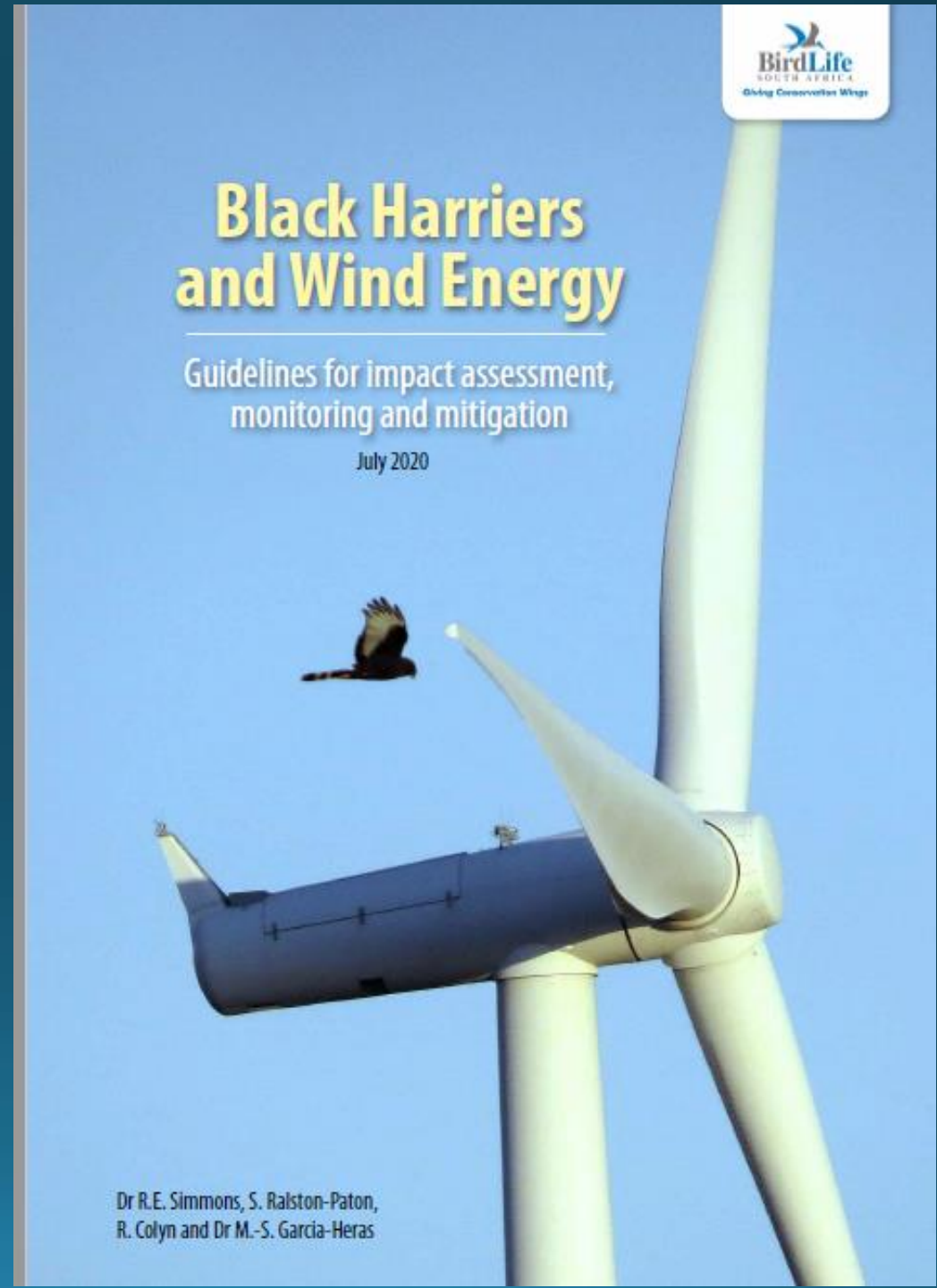


*Are Wind farm fatalities to blame for the decline in BH populations?*

No, but WEFs are just the most visible cherry on the top & could be the final nail in the coffin.

However, BLSA have provided guidelines to reduce impacts:

- Monitoring (nest finding, survey tech)
- Mitigation (nest buffers, avoidance)
- **Biggest driver of decline: Habitat loss.**

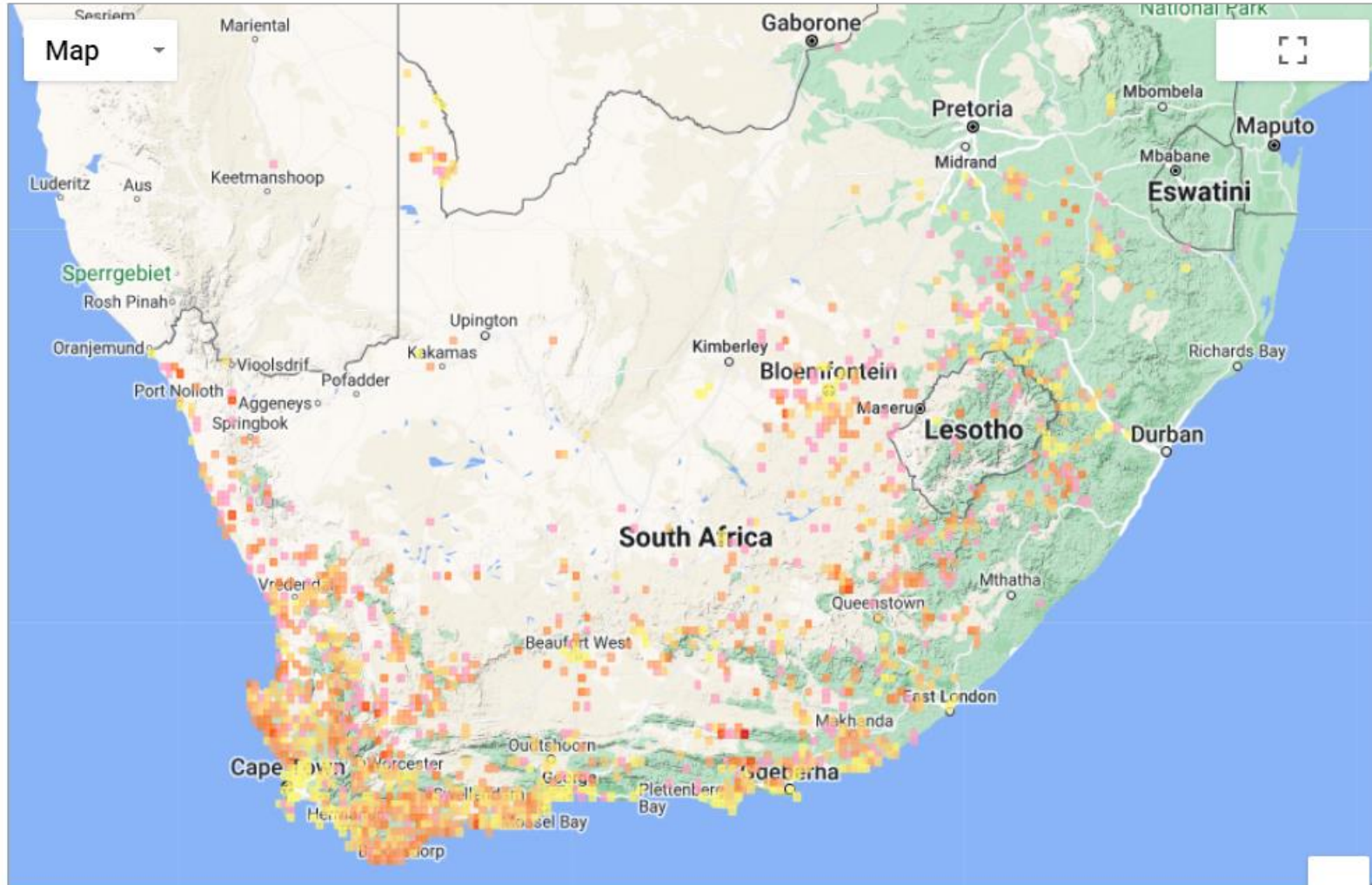




HARRIERS & HABITATS:  
The Overberg Renosterveld Conservation Trust



Species summary: Harrier, Black (*Circus maurus*)

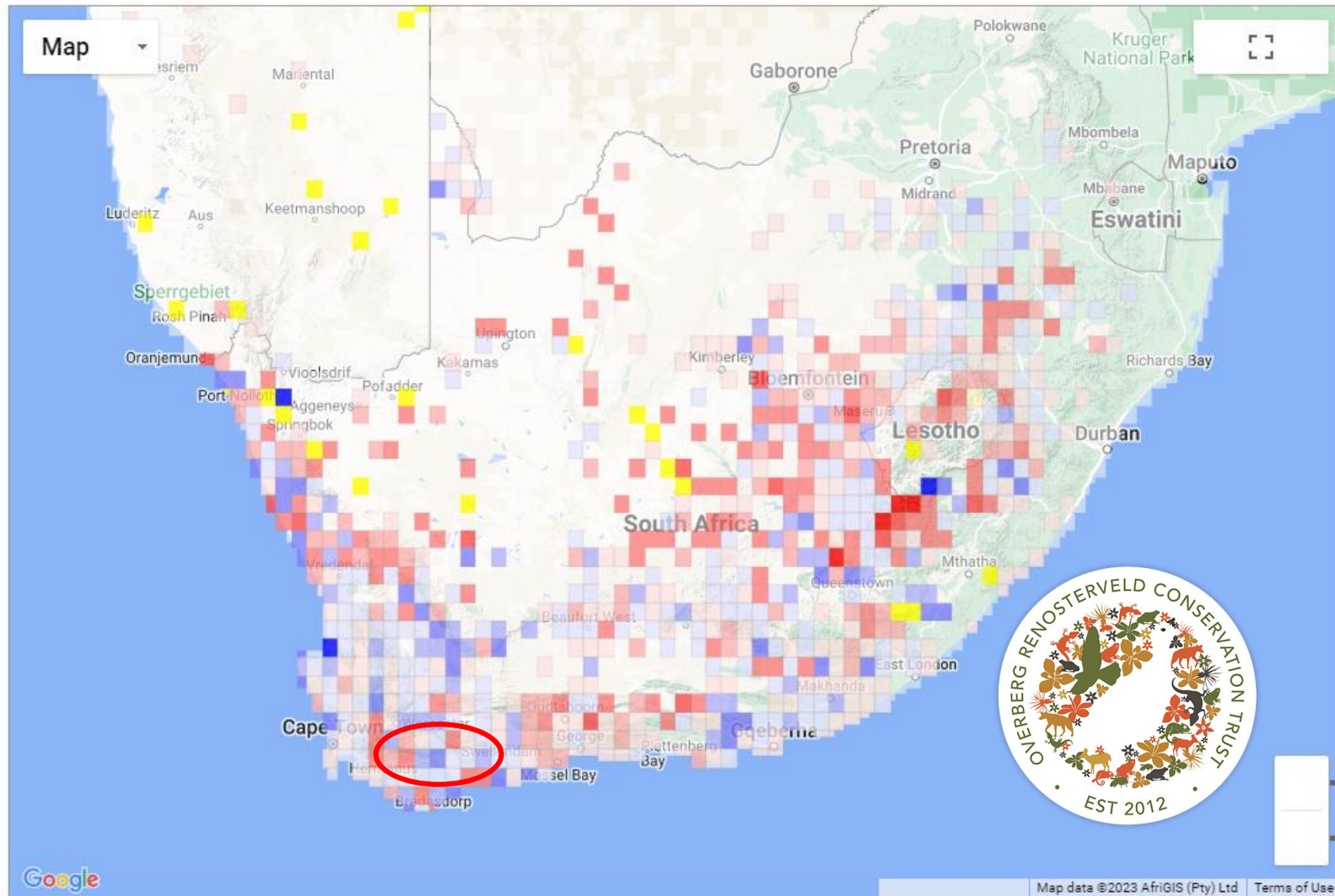


Legend	
	0.1 - 2.5%
	2.51 - 5%
	5.01 - 10%
	10.01 - 20%
	20.01 - 30%
	30.01 - 50%
	50.01 - 75%
	75.01 - 100%
	Under 4 cards for the pentad Adhoc protocol Incidental Additional information
	UNVETTED. These records are where there is no formal project, but data has been collected. These records are not verified as yet.

Map options	
Map type	<a href="#">Simple Map</a> <a href="#">Graded Map</a>
Seasonal animation	<a href="#">Start</a> <a href="#">Stop</a>
Show unvetted/Out of range records	<input type="checkbox"/> ORFs/Unvetted
SABAP1/SABAP2 comparison	<a href="#">SABAP1/SABAP2 comparison</a>



# SABAP 1 & 2 comparison



Show:

- Relative difference in Report rate
- SABAP1 Distribution (QDGC)
- SABAP2 Distribution (QDGC)

include coverage on map

Relative change in Reporting rate	
	Coverage
Dark Blue	50 - 100%
Blue	25 - 50%
Light Blue	10 - 25%
Very Light Blue	5 - 10%
White	0.001 - 5%
Light Pink	-0.001 - (-5)%
Light Red	(-5) - (-10)%
Red	(-10) - (-25)%
Dark Red	(-25) - (-50)%
Very Dark Red	(-50) - (-100)%
Yellow	Insufficient data (below 4 SABAP2 cards per QDGC)

But the species is HIGHLY NOMADIC (like the BWK) and reporting rates are almost certainly influenced by RRR & droughts.

## WHAT IS RENOSTERVELD?

To those unfamiliar with it, it APPEARS to be a superficially homogenous shrubland, with a dull and drab appearance, particularly if old or degraded...  
Subjected to a large array of threats, fragmented, in a matrix of monoculture...



Part of the Fynbos Biome, but typically found in the clay-based regions,  
adjacent to its more showy cousin, Fynbos.



BUT.... It is also considered one of the richest Mediterranean Ecosystems

And the richest geophyte (bulb) habitat on Earth

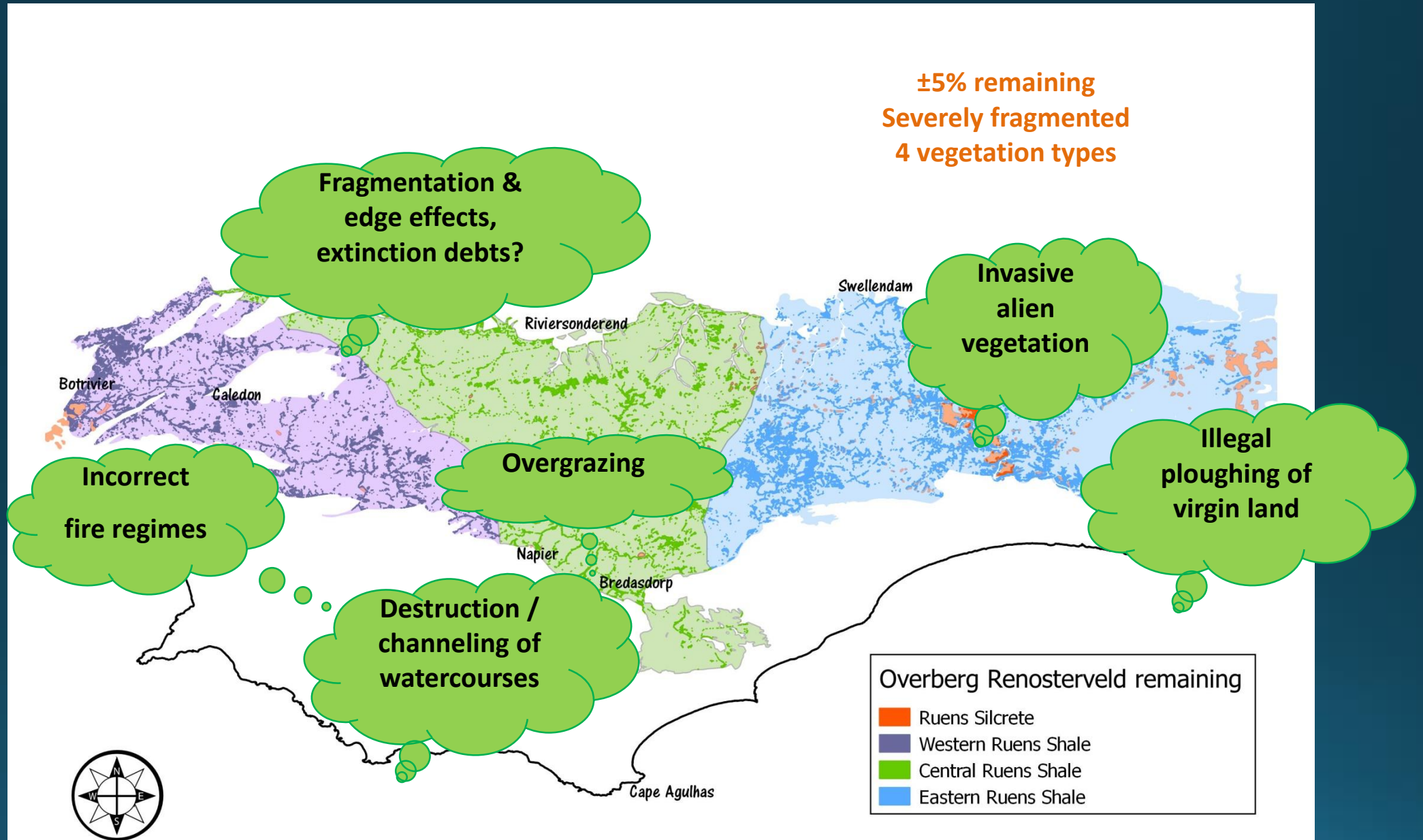
There is nothing grey and drab about it! IT IS AWESOME!!!



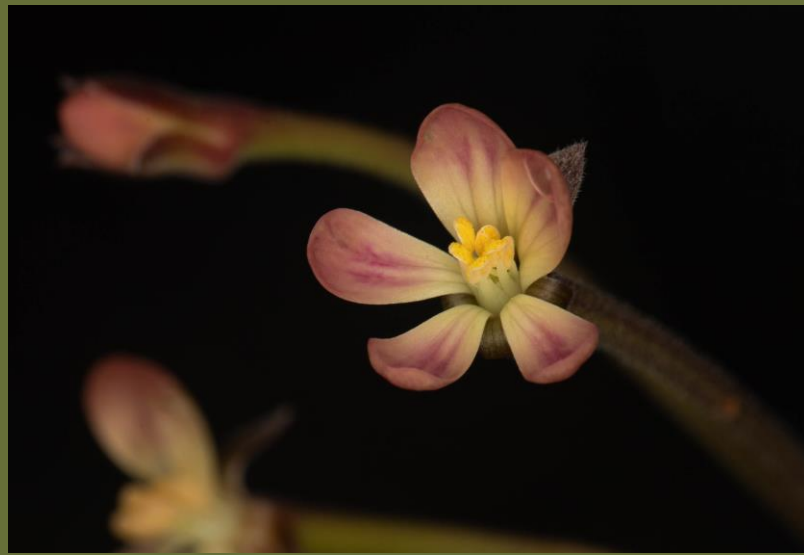
300 years ago...



# WHAT IS RENOSTERVELD & WHY IS IT SO THREATENED?



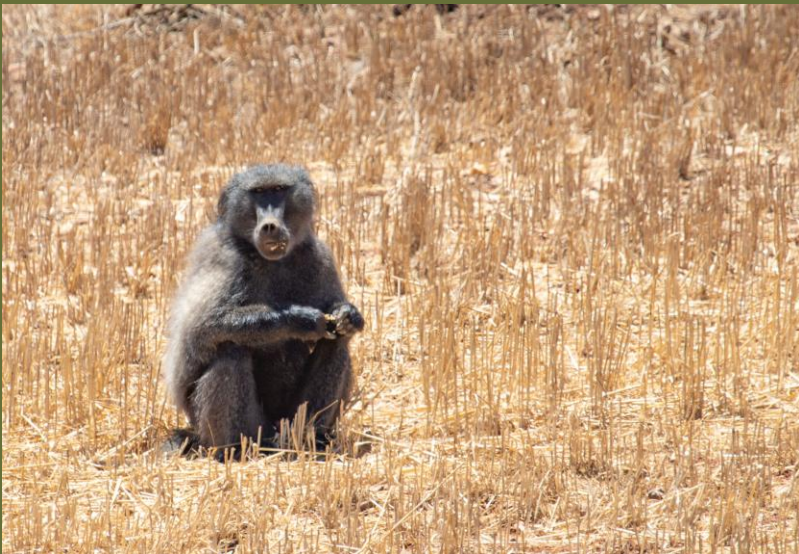














Overberg Renosterveld Conservation Trust















## The orct

- Established 2012.
- Focus: protecting the last remnants (5%) of remaining renosterveld in the Overberg, and ALL the biodiversity housed within this Critically Endangered habitat.
- Emphasis on engaging and partnering with landowners in the wheat-belt.





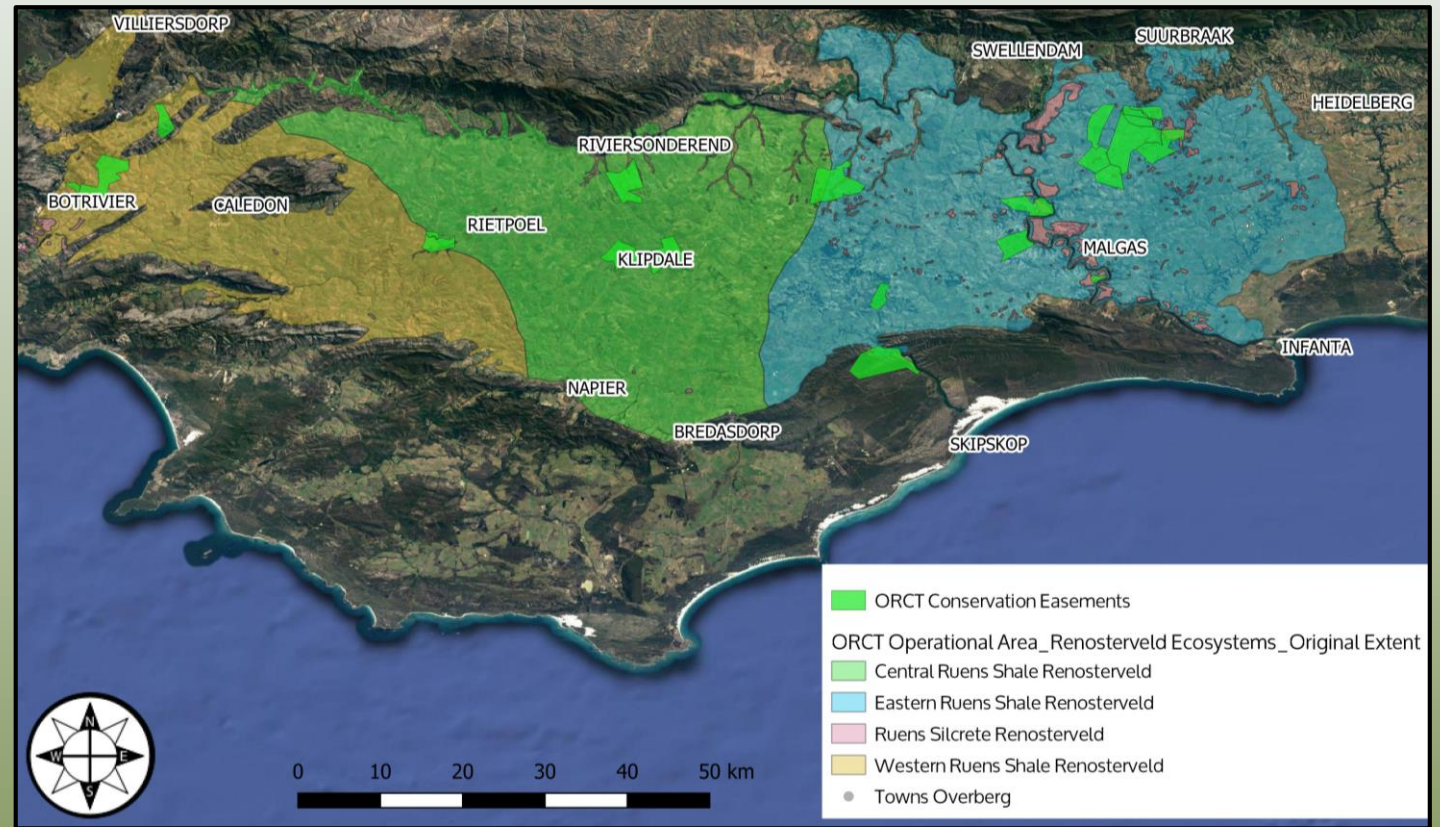
## SECURING HECTARES: Conservation Easements

- Enables voluntary conservation servitude with title-deed restrictions, in perpetuity.
- Ha of Renosterveld are formally conserved & therefore actively managed and / or restored.
- Landowners being capacitated to become veld managers. Landowners leave a legacy.



# Renosterveld Hectares secured (through conservation servitudes registered on title-deeds in perpetuity)

- Since 2017, we have signed >6500 ha (>4500 renosterveld) into conservation easements
- Comprising 21 easements



- ▶ Landowners receive substantial assistance with management of their veld in return for signing an Easement.
- ▶ Including: alien clearing, ecological burning, fencing, watercourse management & erosion control



Overberg Harrier research: ORCT with Dr Rob Simmons



Background: Early Black Harrier  
surveys:

2000-2007

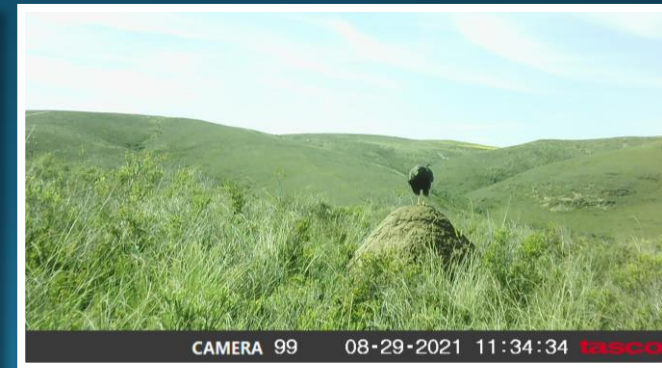
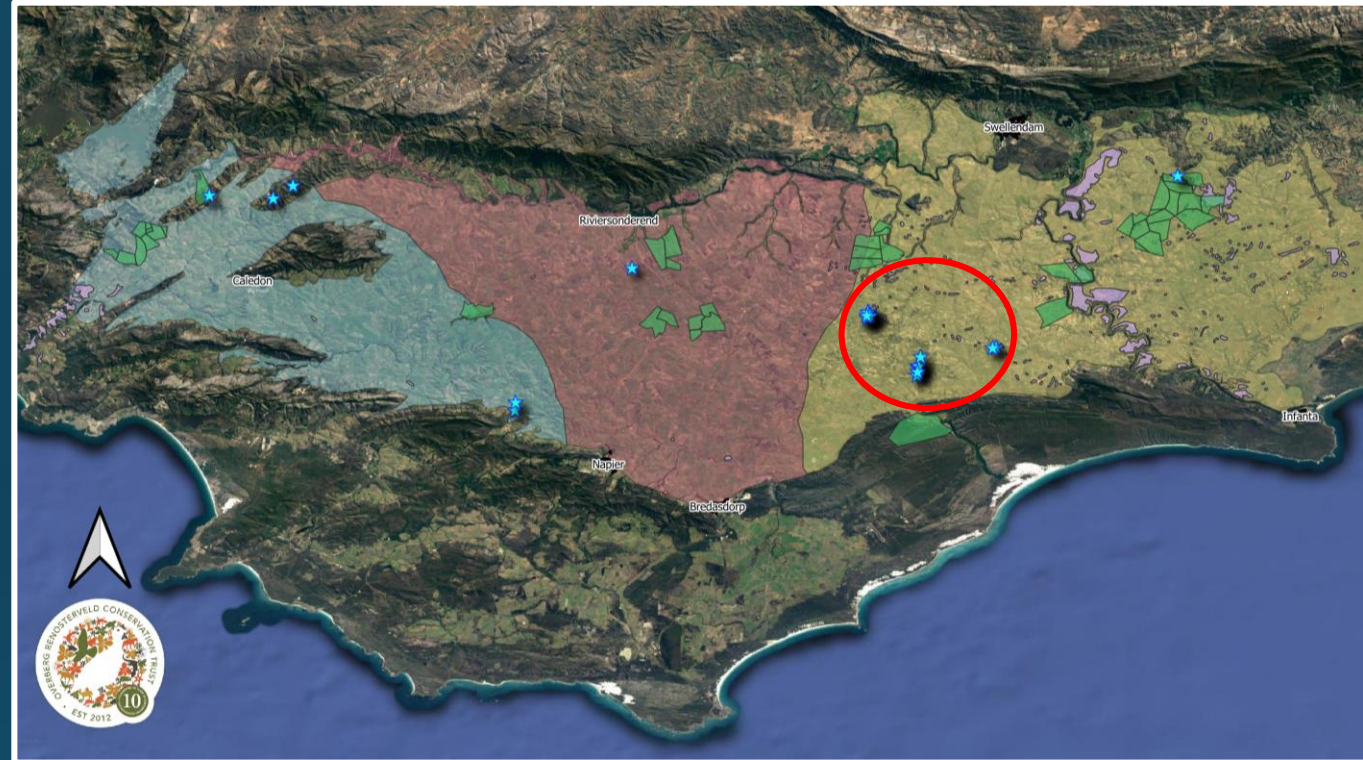
- To find if BH use renosterveld for breeding: If so, one could then assume that they have lost a significant proportion of their breeding habitats.
- MSc study (2003-2005): 100 renosterveld remnants surveyed in the Overberg and Swartland (50 in each): Only 10 LARGE remnants in the Overberg had breeding BH.



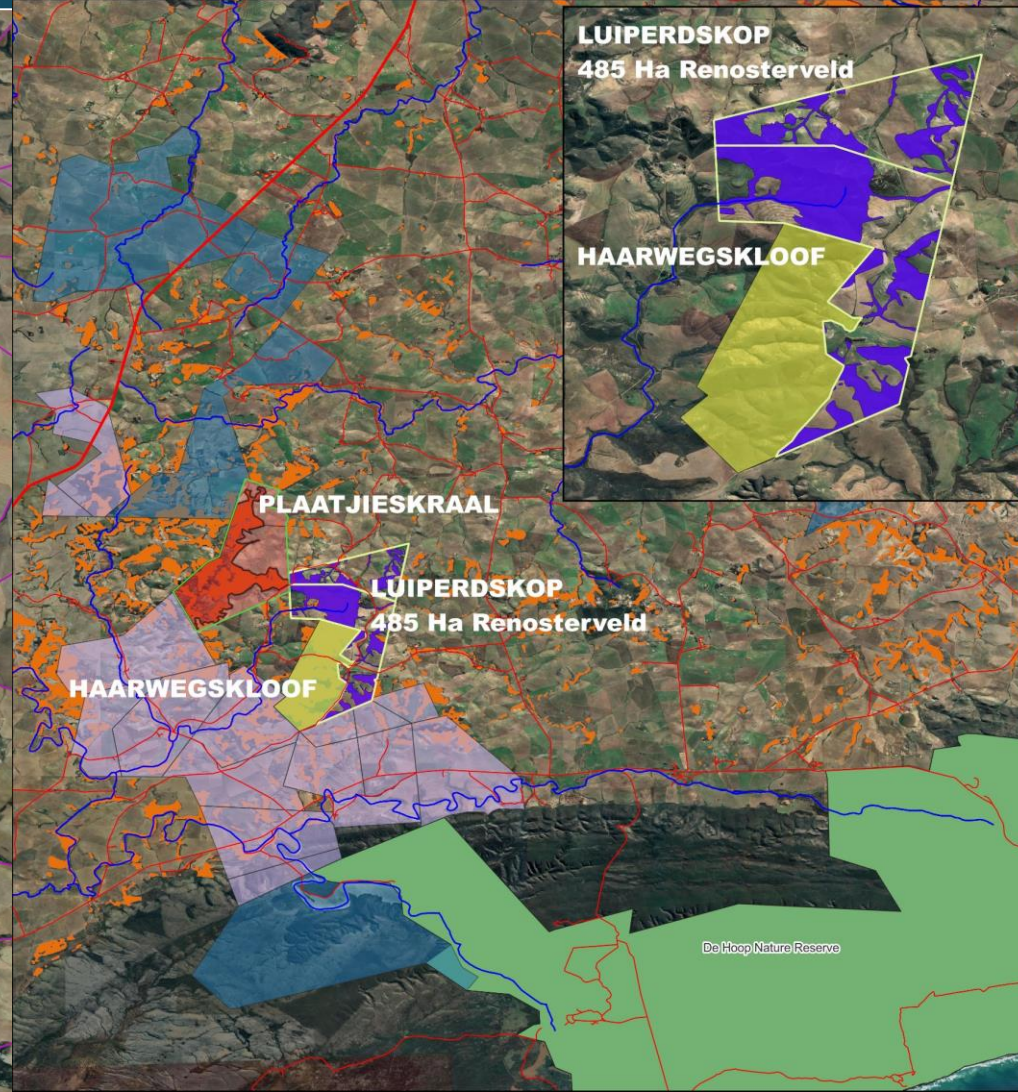
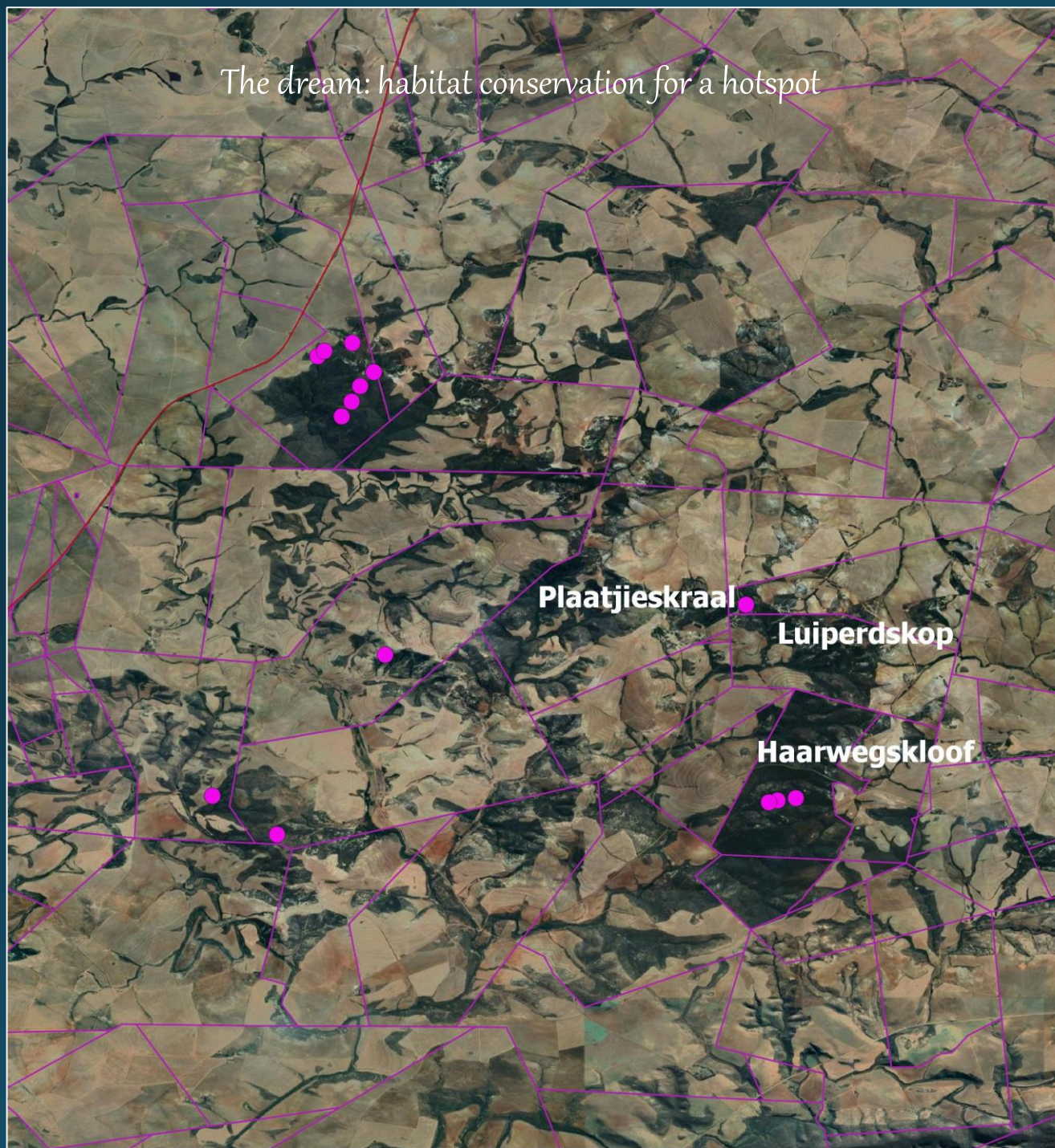


More detailed surveys in the Overberg (2014-2021)

- Black Harriers have a **breeding stronghold** in renosterveld, particularly in the Eastern Rûens: as many as 20-25 nests on just three sites!
- Many more expected on adjoining sites, where we are trying to purchase veld / negotiate easements.
- **THE OVERBERG RÛENS IS A CRITICAL BREEDING AREA FOR THE SPECIES**



The dream: habitat conservation for a hotspot



**Legend**

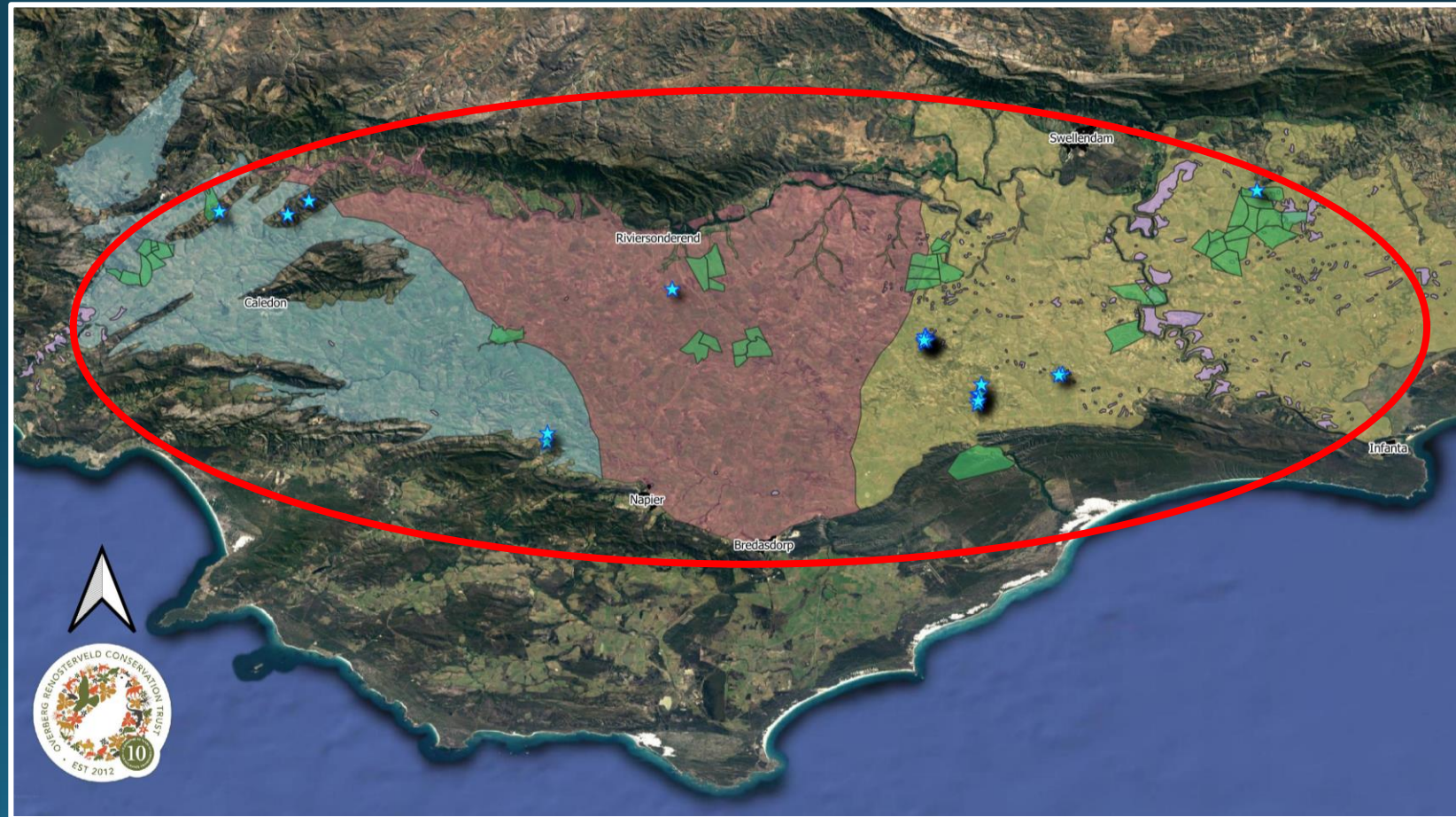
- |                |   |  |                              |                               |
|----------------|---|--|------------------------------|-------------------------------|
| Rivers         | — | Plaatjieskraal Property Boundary       | ORCT Targets for Easements   | Plaatjieskraal Nature Reserve |
| <b>Roads</b>   | — | Plaatjieskraal Agricultural Production | Haarwegskloof Nature Reserve | ORCT Conservation Easements   |
| MAIN ROAD      | — | Plaatjieskraal Nature Reserve          | Protected Areas              | Remaining Renosterveld        |
| OTHER ACCESS   | — | Luiperdskop Property Boundary          |                              |                               |
| SECONDARY ROAD | — | Luiperdskop Natural Areas Remaining    |                              |                               |







Overberg wheat-belt = 'redz'  
=renewable energy development zone



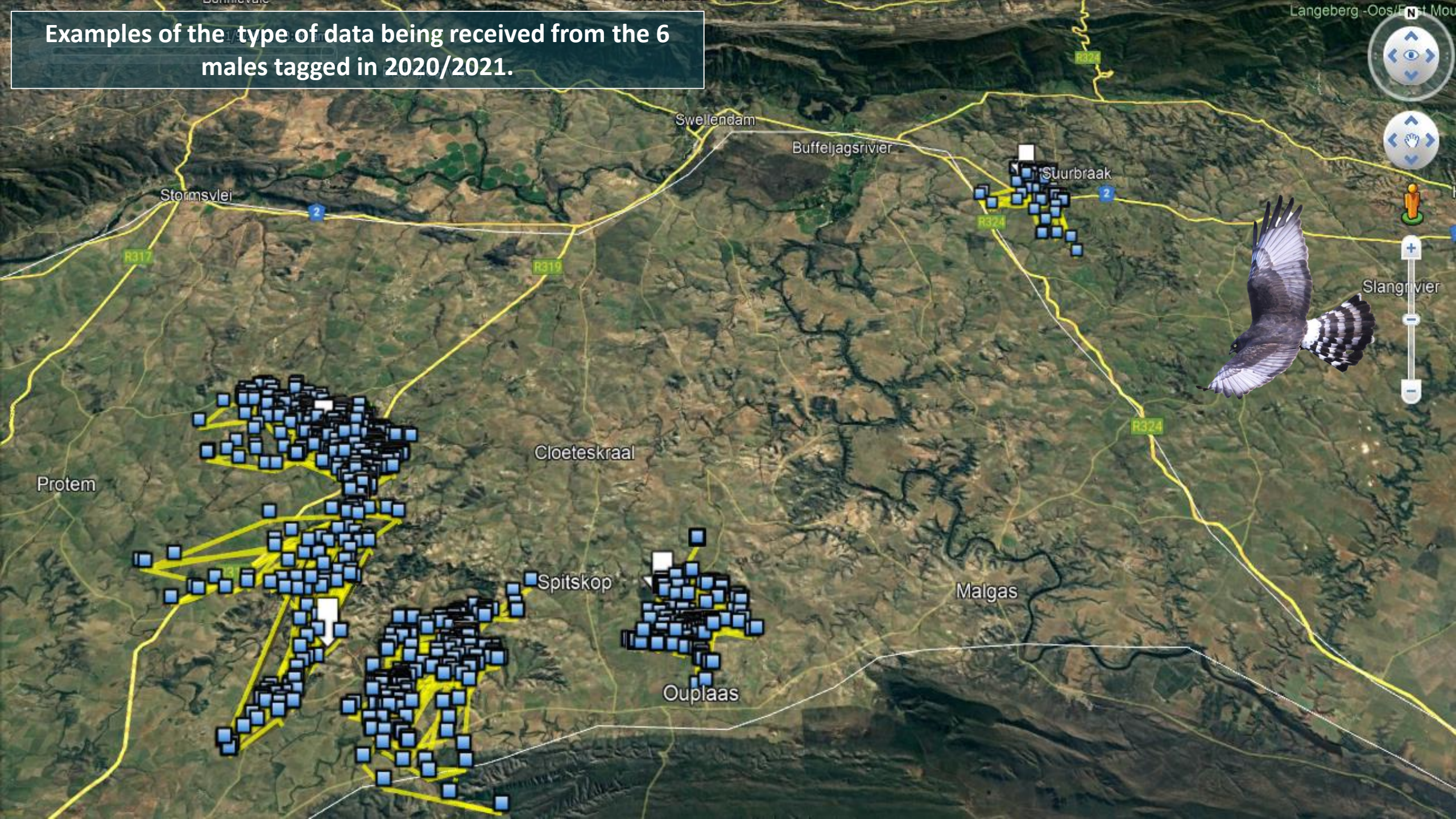
Black Harrier tagging



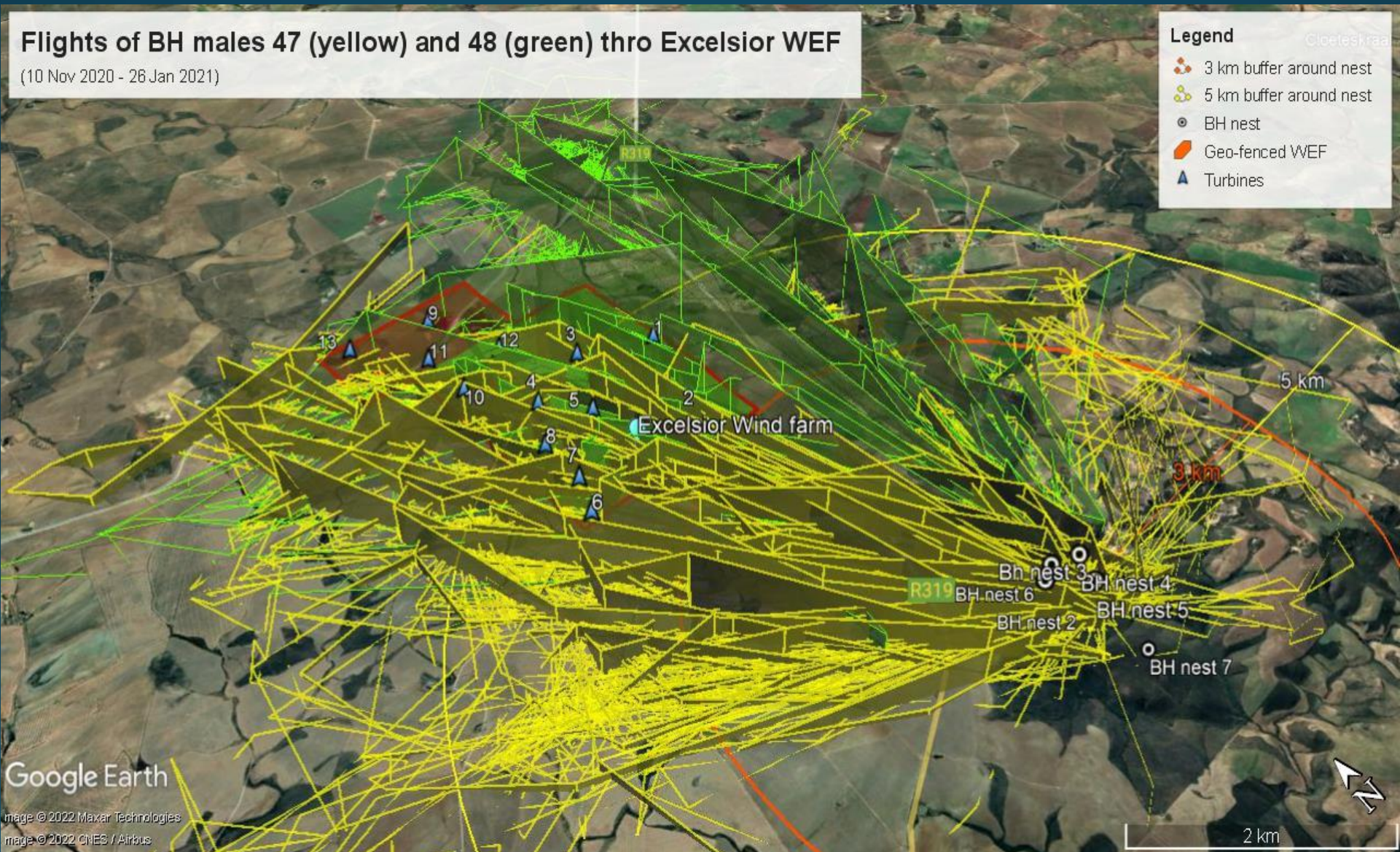
<https://www.backabuddy.co.za/champion/project/saving-black-harriers>

10 birds tagged in total since 2020.  
Nine more tags for 2023.

Examples of the type of data being received from the 6 males tagged in 2020/2021.



Effect of wind farms on Black Harriers: Do they avoid them? **NO!**



Data from Ornitela GPS trackers: (Simmons and Curtis-Scott, unpubl data)



One male's travel-log, until he was lost in May 2021 and presumed dead. Meanwhile, he was alive and well, but the tag was faulty.....



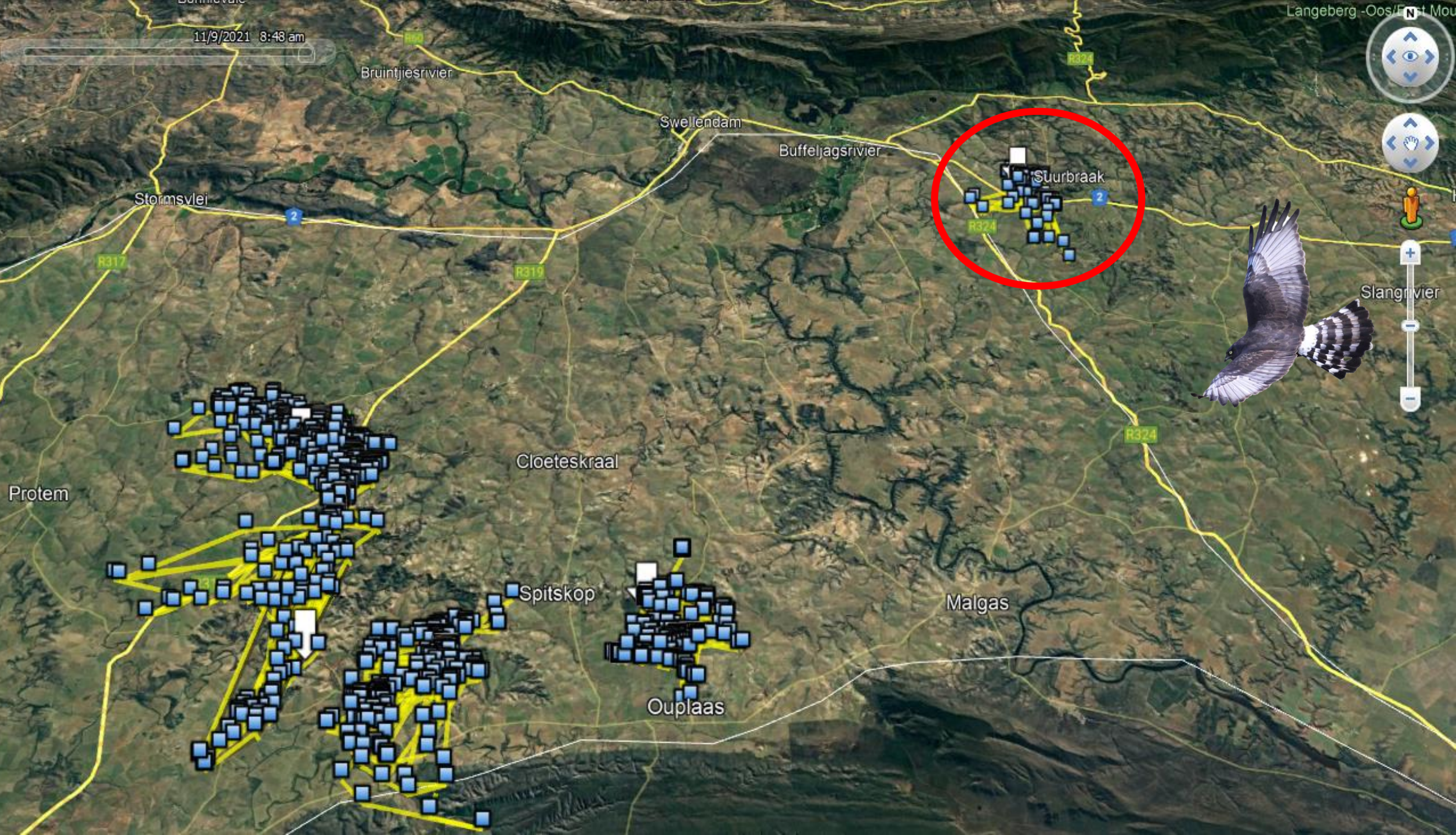
*Male killed by turbine at Excelsior  
Windfarm on 5<sup>th</sup> November 2021.*

Reported to ORCT by windfarm  
monitoring team immediately.

(Tag was faulty (had stopped  
working in May), was replaced  
by manufacturer and fitted to a  
new bird in 2022).

11/9/2021 8:48 am

Langeberg - Oos/Est Mou





*Male roosting in wheat field killed by wheat-cutter on 4th November*

It appears the bird was roosting (at night) in a wheat field on the other side of the N2 (from his nest) and must have been caught unawares by the cutter at night.

This has not been recorded before, so this may represent a previously unknown and additional threat to the species.



Closer look at foraging over breeding  
season



# Male TT 1 day

October



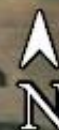
Spitskop

Ouplaas

Ovetberg Agri Petrol Station

Google Earth

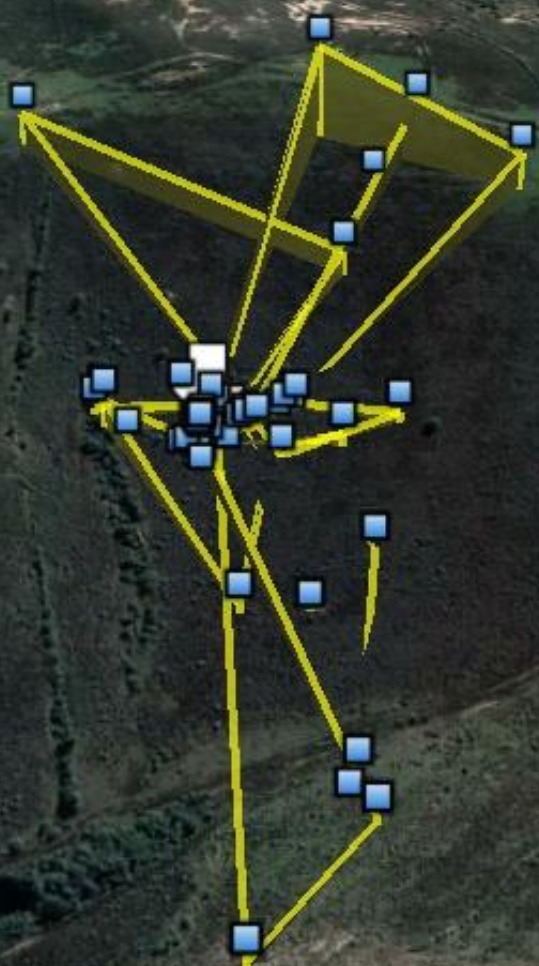
Image © 2023 Maxar Technologies



2 km

# Female TT 1 day

October



Google Earth

Image © 2023 Maxar Technologies



300 m

Overberg breeders also head east for winter

### Legend

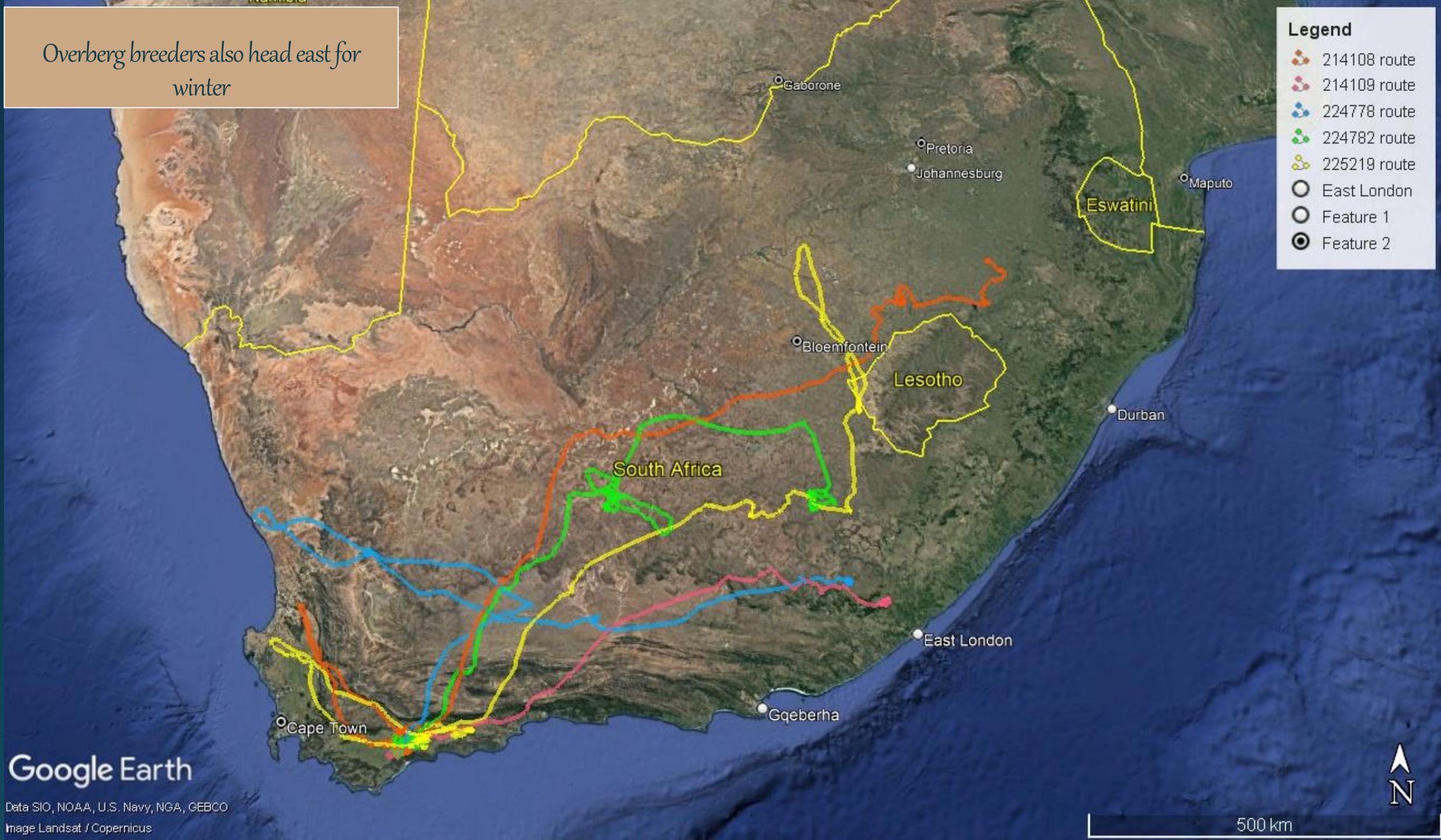
- 214108 route
- 214109 route
- 224778 route
- 224782 route
- 225219 route
- East London
- Feature 1
- Feature 2

Google Earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image Landsat / Copernicus



500 km





- Concern over the mortality rates amongst our tagged birds: urgently need to investigate if this is representative of the population's mortality rates.
- Additional satellite tags to be fitted throughout the BH breeding range, particularly at breeding hotspots and areas where windfarms exist or are being considered.
- Windfarms did not cause the current decline, but could be the final nail in the coffin.... Lobbying to government for mitigation measures as part of approval process + audits to confirm compliance is CRUCIAL.
- Conservation of breeding, foraging and roosting areas is crucial for the species' long-term survival. Conservation stewardship, Conservation easements and land purchase are some of the ways in which this can be achieved.

## BLACK HARRIER TASK FORCE *Priorities:*

Development of a species management plan for BH throughout their range.

- Plan needs to include HABITAT conservation & management plan: breeding, roosting & wintering sites.
- Plus an analysis of all available data to identify no-go areas for WEFs.
- Plus a set of mitigation measures which need to be put in place on new & existing wind farms

Lobby government to enforce no-go areas for Black Harriers, as well as 'uniformity' of mitigation measures across all WEFs.



Thank you!



[www.overbergrenosterveld.org.za](http://www.overbergrenosterveld.org.za)