Gembloux Agro-Bio Tech
Université de Liège

Journée d'étude « Gestion rationnelle et conservation de la grande faune »
Forest Resources Management (GxABT/Ulg), 13th October

WiMUAS: New inventory method to perform wildlife counts with UAS and review the large datasets

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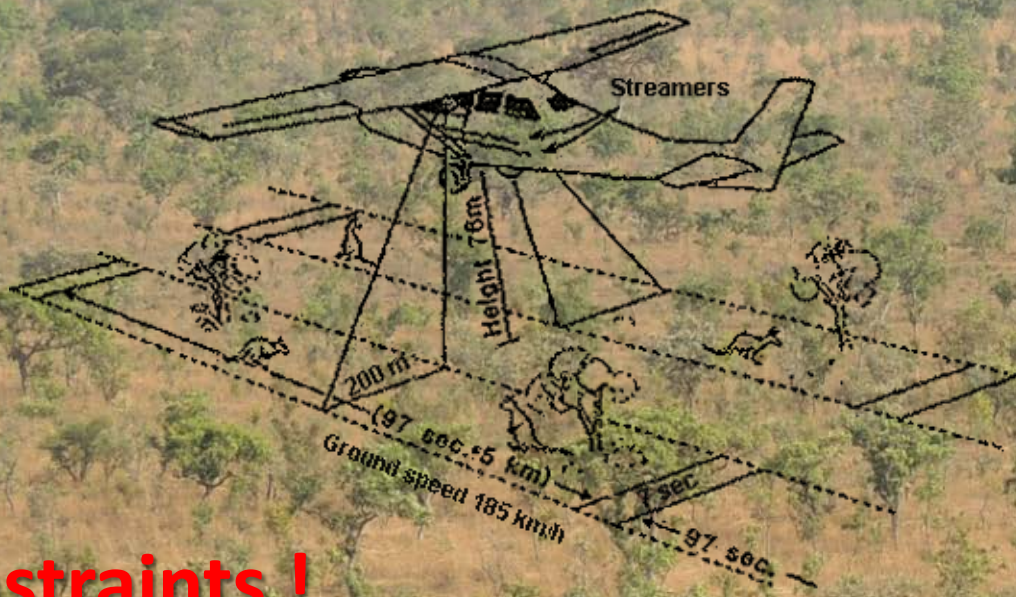
Regular, standardized animal population inventories = Management key to preserve wildlife

Usually aerial inventories with manned aircraft

➔ Ideal for wide flat landscape of Africa



! But many constraints !

UAS, a new opportunity?

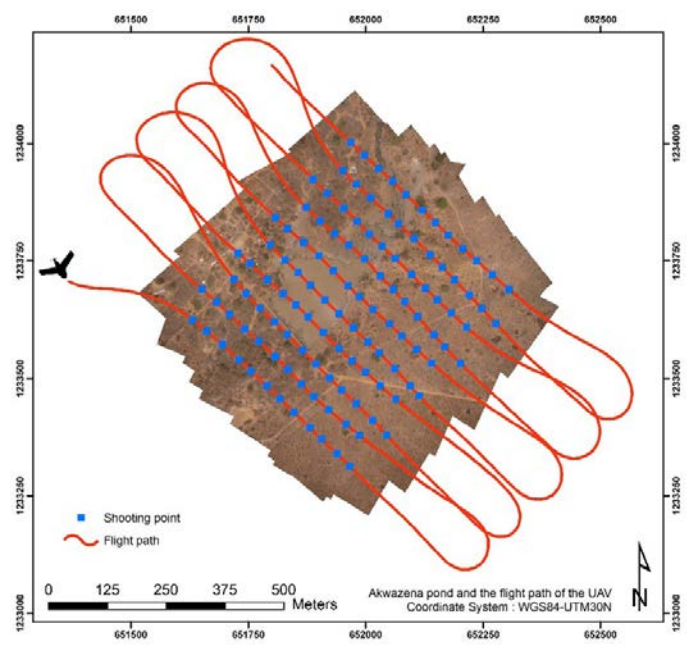
- High spatial and temporal resolution
- Repeatible flight plans
- Permanent data
- Several sensor types
- Fly low and slow

Problems?

Small areas covered >< Huge data sets

Main limitations
➔ endurance and range

Why use classic methods?



× **Statistics unknown**

✓ **Flight parameters files available**

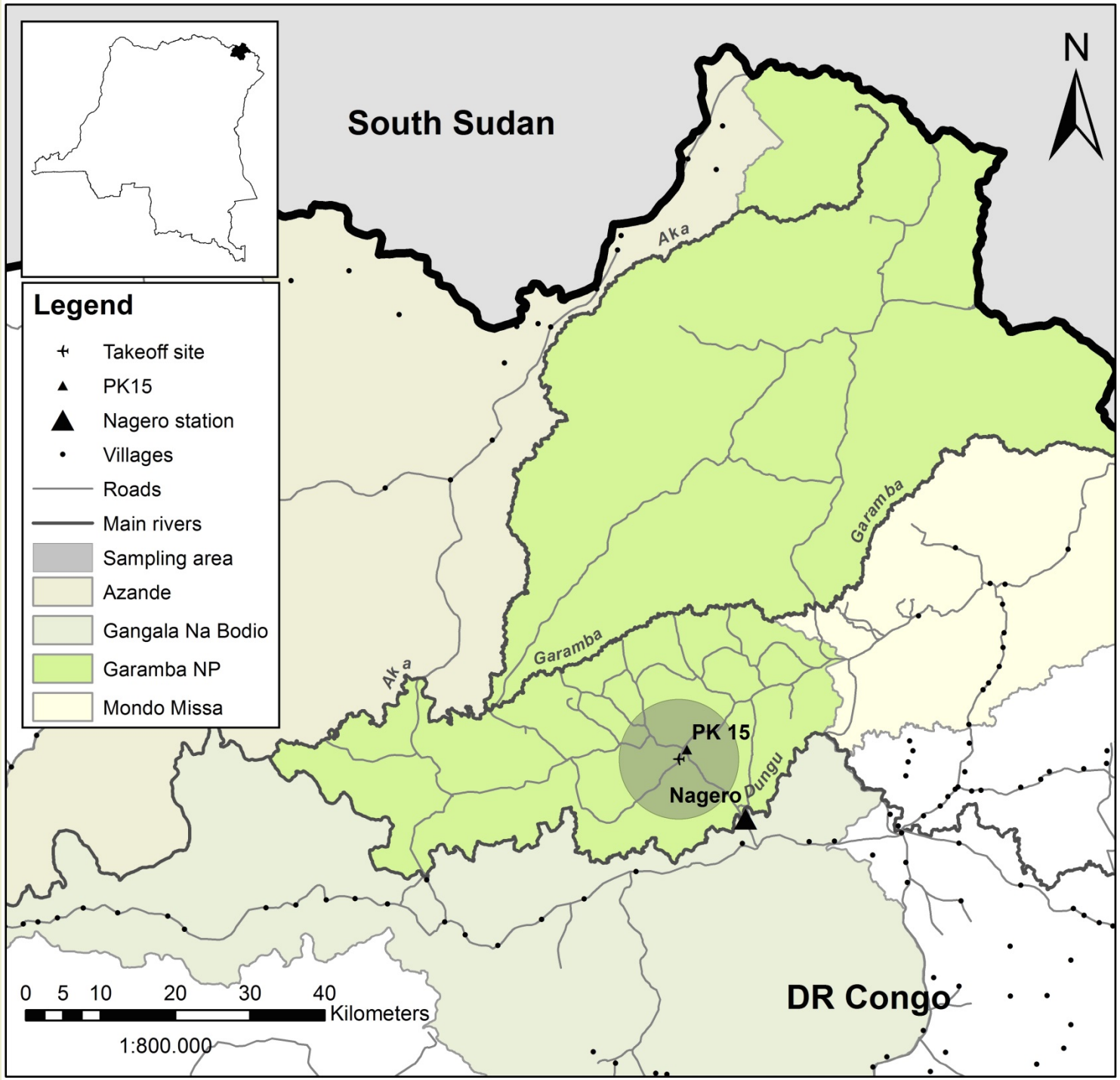
OBJECTIVES

1. Create an easy tool to analyze huge datasets from all UAS inventories

- **Observation database**
  - Multiple observers
  - Easy counting process for observer
  - Modifiable obs.
  - Generate counting results and comparisons
- **GIS compatible**
  - Generate accurate sampling surface
  - Project observation points

2. Test new flight plan

- **Estimate populations**
  - ≠ observer counts
  - Generate total count and density
  - Sampling surface and rate
- **Compare flight plans**


South Sudan
N
Legend
Takeoff site
PK15
Nagero station
Villages
Roads
Main rivers
Sampling area
Azande
Gangala Na Bodio
Garamba NP
Mondo Missa
Aka
Garamba
Garamba
Aka
PK 15
Nagero
Dungu
DR Congo
0 5 10 20 30 40
Kilometers
1:800.000

STUDY AREA

UAV Falcon:

- Electric propulsion
- 45 min endurance
- Digital radio link (telemetry and video)
- 8-10 km range (obstacle free)
- Cruise speed 50km/h
- APM/Mission Planner©

Payload:

- Sony Nex7
- 24MP
- No gimbal

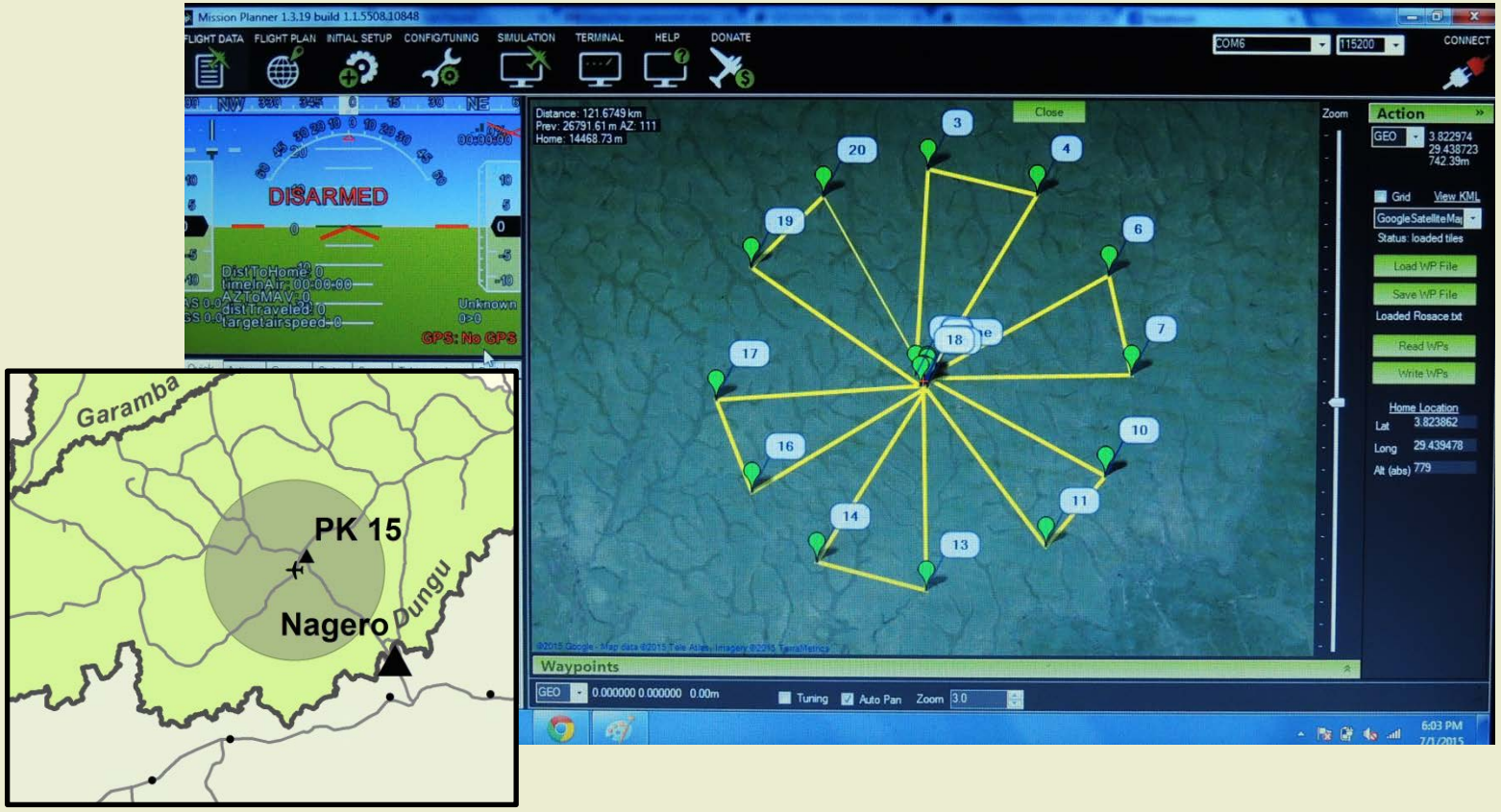
Buffaloes, elephants, giraffes, hippos, lions, various antelopes

Average flight altitude: 100m

➔ Footprint: 119 x 82 m

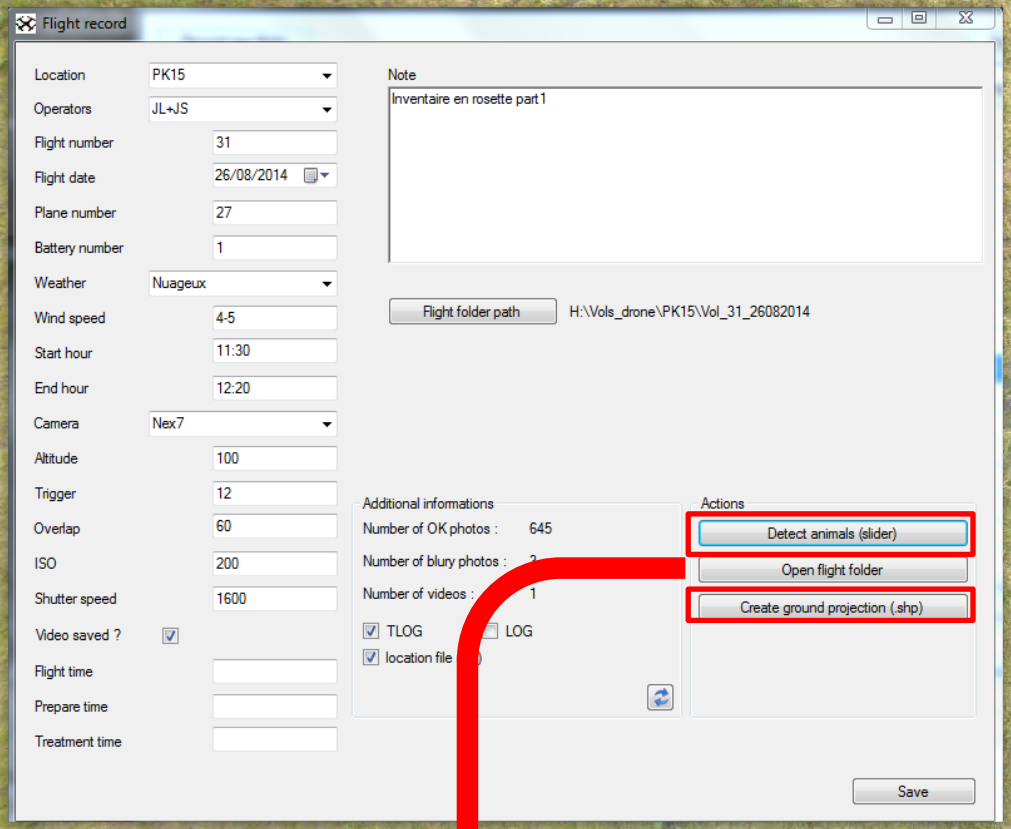
3 flights a day, 40 km per flight, 8 km range

Rosette-shape is the most efficient (?)



120 km of transects in 3 x 2 petals of 20 km

WiMUAS software :



Starts with a logbook

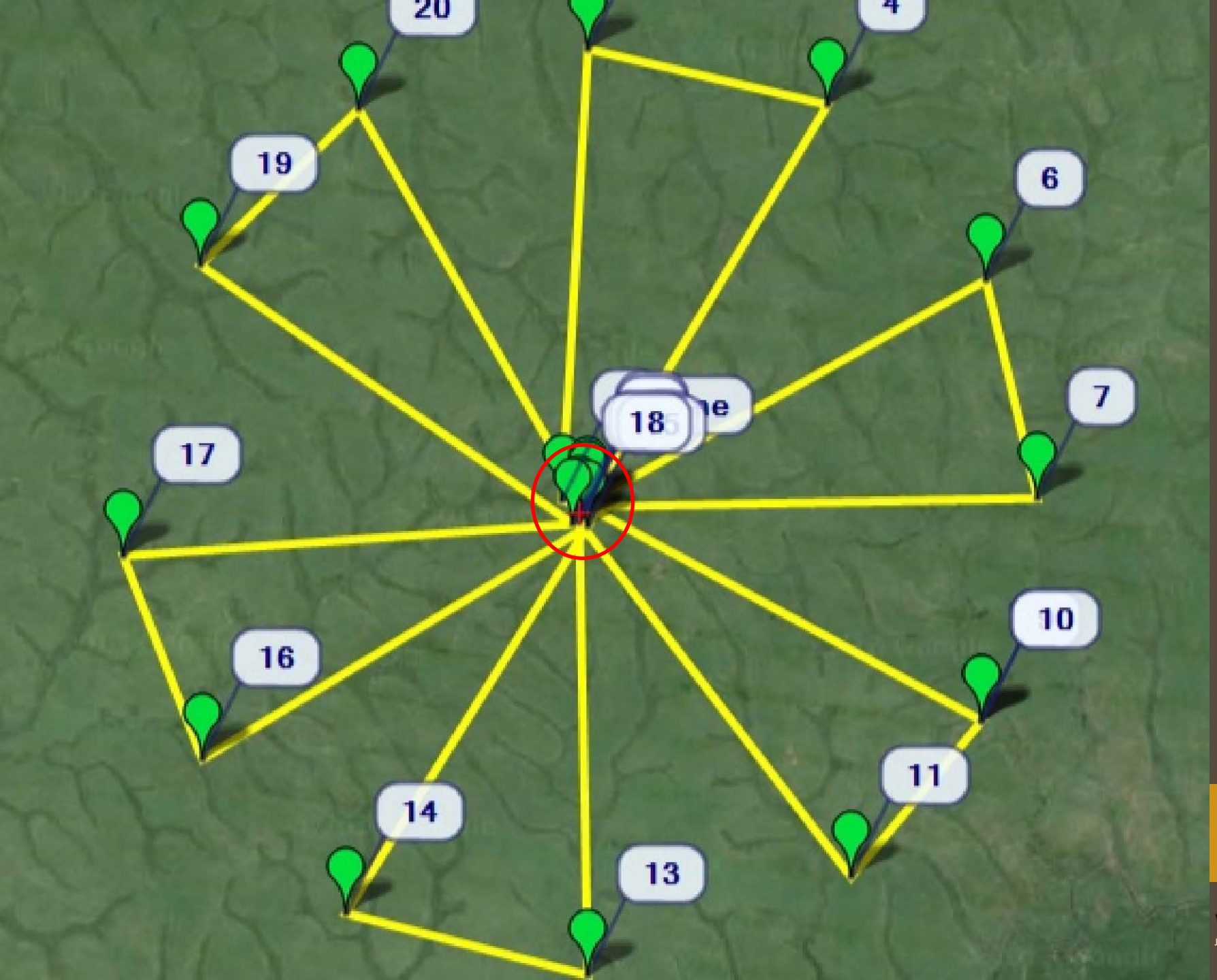
- All flight characteristics and environmental conditions
- Specific folders for each flight and type of files.
- log files, photos and videos files

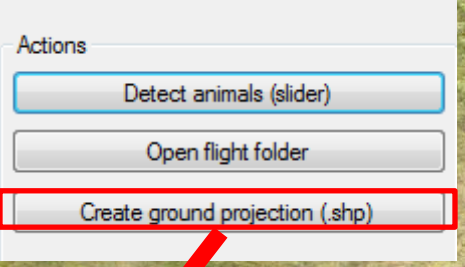
To estimate wildlife density

➔ Area covered

➔ Animal count

Both treatments need to be done only for efficient parts of the flight!

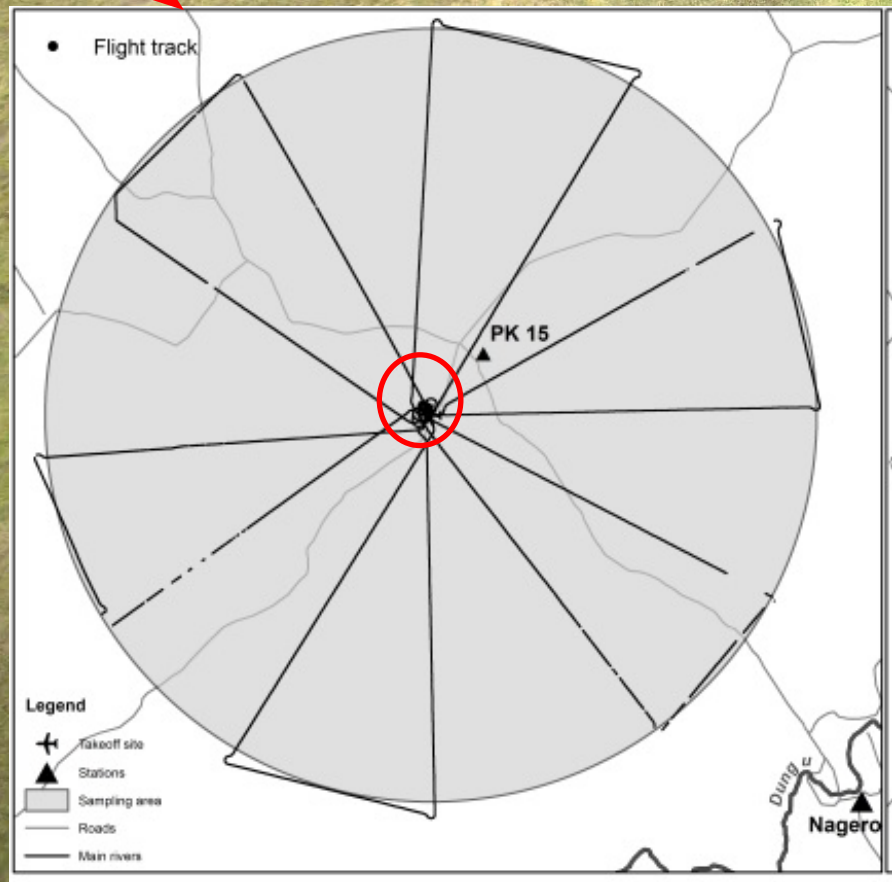

20
4
19
6
18
7
17
16
10
14
11
13

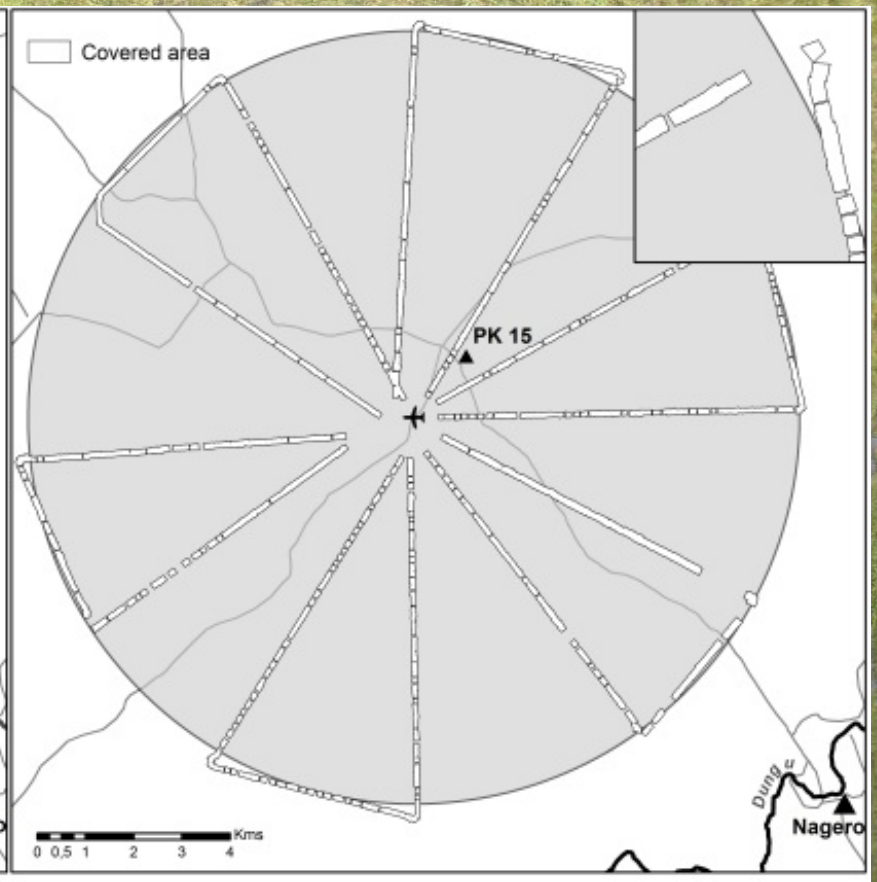


Project GPX and select waypoints to be discarded

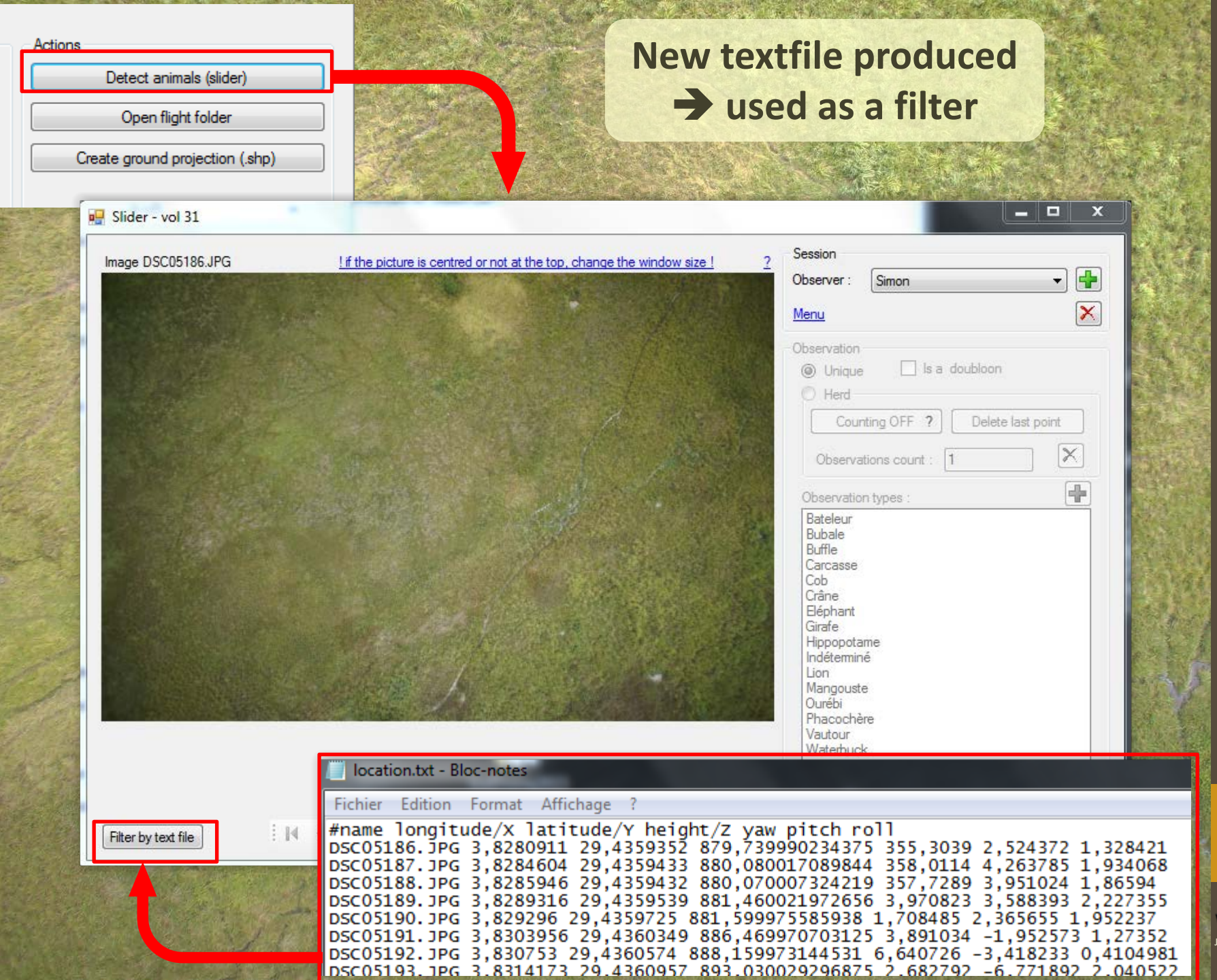
Generate a shapfile of projected image footprints

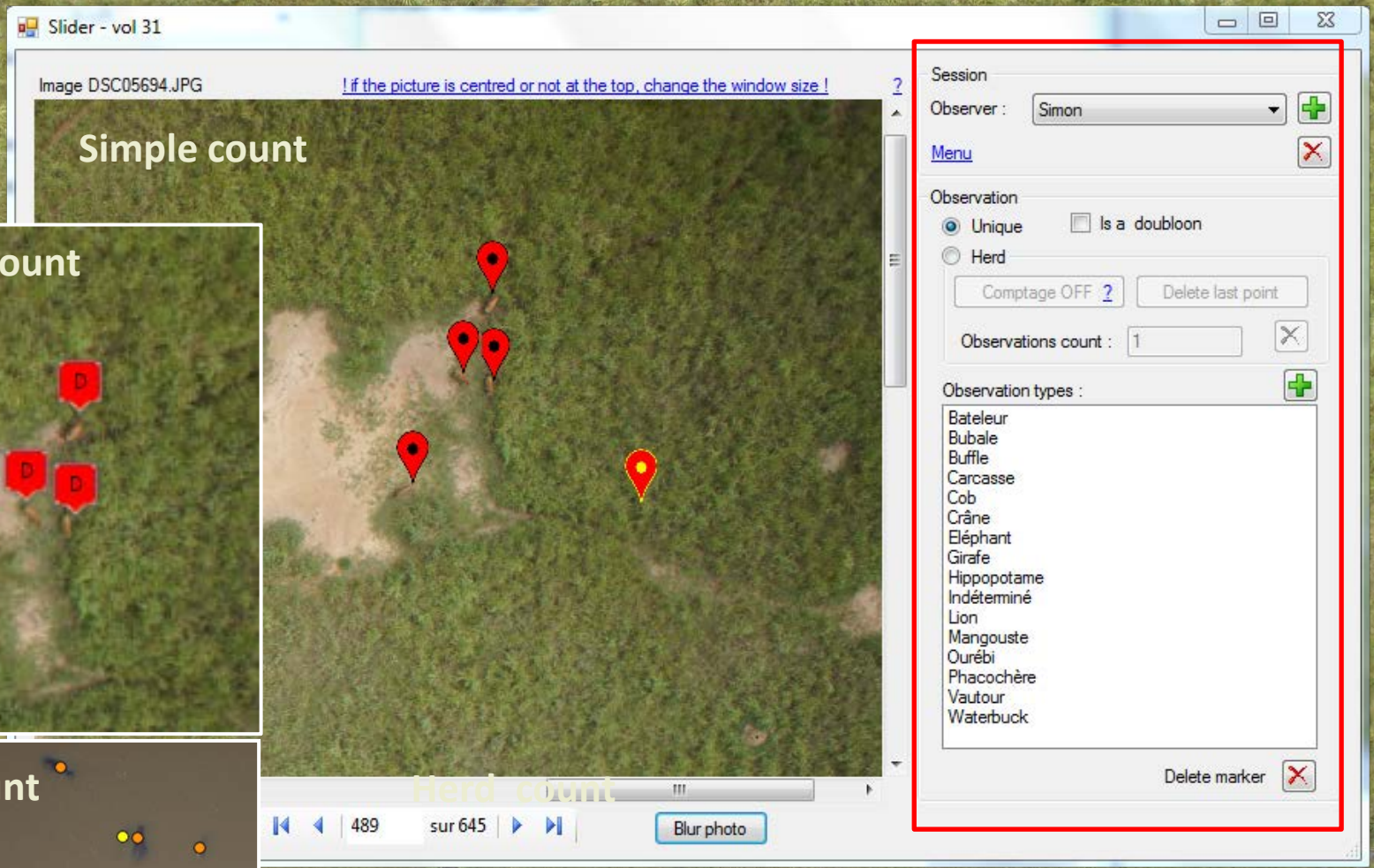
- ➔ Use the flight parameters and orientation data
- ➔ Use the average flight altitude, 100m





RESULTS


Actions
Detect animals (slider)
Open flight folder
Create ground projection (.shp)
New textfile produced
➔ used as a filter
Slider - vol 31
Image DSC05186.JPG
! if the picture is centred or not at the top, change the window size !
?
Session
Observer :
Simon
Menu
Observation
Unique
Is a doubloon
Herd
Counting OFF ?
Delete last point
Observations count :
1
Observation types :
Bateleur
Bubale
Buffle
Carcasse
Cob
Crâne
Eléphant
Girafe
Hippopotame
Indéterminé
Lion
Mangouste
Ourébi
Phacochère
Vautour
Waterbuck
Filter by text file
location.txt - Bloc-notes
Fichier Edition Format Affichage ?
#name longitude/X latitude/Y height/Z yaw pitch roll
DSC05186.JPG 3,8280911 29,4359352 879,739990234375 355,3039 2,524372 1,328421
DSC05187.JPG 3,8284604 29,4359433 880,080017089844 358,0114 4,263785 1,934068
DSC05188.JPG 3,8285946 29,4359432 880,070007324219 357,7289 3,951024 1,86594
DSC05189.JPG 3,8289316 29,4359539 881,460021972656 3,970823 3,588393 2,227355
DSC05190.JPG 3,829296 29,4359725 881,599975585938 1,708485 2,365655 1,952237
DSC05191.JPG 3,8303956 29,4360349 886,469970703125 3,891034 -1,952573 1,27352
DSC05192.JPG 3,830753 29,4360574 888,159973144531 6,640726 -3,418233 0,4104981
DSC05193.JPG 3,8314173 29,4360957 893,030029296875 2,682792 -6,771892 2,040522



Slider and point and click tool, multiple observers, modifiable observations, export and import database from different people

	Trial 1			Trial 2		
Flights	**F 1**	**F 2**	**F 3**	**F1**	**F 2**	**F 3**
Flight time (min)	50	45	45	50	45	50
Total photos taken	784	622	587	1300	993	1087
Photos discarded	136	90	71	130	80	179
Photos considered for detection	648	532	516	1170	913	908
Blurry photos	3	2	3	15	7	3

Number of photos depends of overlap : 60 and 80%

10-20% of the photos lost

Photos discarded mainly due to landing phase and gaps in the .tlog file because of loss of communication

Journée faune 2
13/10/2015

Generate comparative results, list images with observations and list differences between observers

➔ possibility to review errors and create a more accurate total

	Trial 1				Trial 2			
Species	O1	O2	O3	Total	O1	O2	O3	Total
Buffaloes	232	245	249	**249**	19	5	9	**10**
Elephants	0	4	0	**0**	0	2	0	**0**
Giraffes	0	0	0	**0**	0	1	0	**0**
Hartebeests	3	8	12	**13**	9	8	4	**6**
Hippos	22	24	26	**23**	36	28	27	**35**
Cobs	12	16	14	**14**	5	8	16	**18**
Warthogs	3	6	8	**9**	5	25	28	**27**
Waterbucks	0	0	1	**1**	0	0	3	**3**
Total	**272**	**303**	**310**	309	**74**	**77**	**87**	99

Strong observer effect : Trained >>> novice (CV : 6,9 and 8,6%)

Mean sampling rate considering a circular area of 201 km² = 6,1%

	Trial 1	Trial 2
Sampling area (km²)	12,4	12,1
Total animals	309	99
Total density (ind/km²)	25,0	8,2
Total w/o buffaloes	60	89
Density w/o buffaloes (ind/km²)	4,9	7,3
Total w/o specific groups*	37	54
Density w/o specific groups* (ind/km²)	3,0	4,5

*Specific groups = Buffaloes, elephants, giraffes and hippos

Big differences between the 2 tests

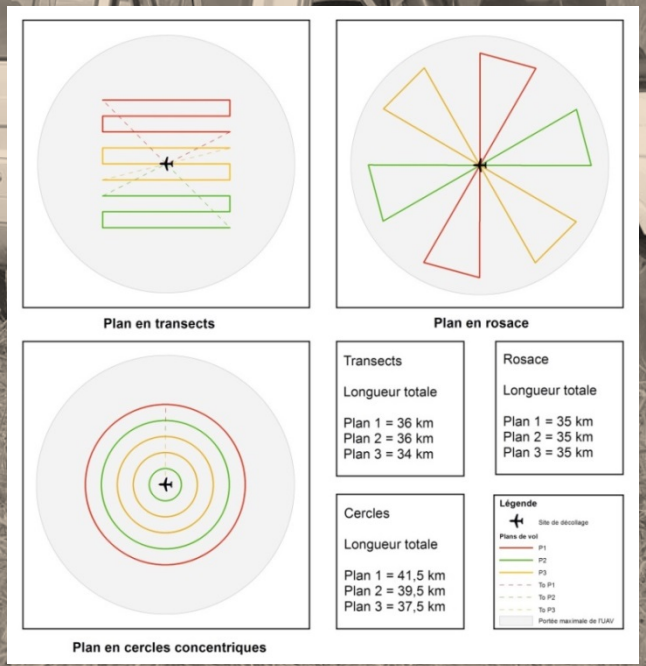
➔ Problem of the very low sampling rate and the small area covered

Results:

- ✓ Easy tool to review data for everyone, from researchers to park managers,
- ✓ Total observation number after comparison is higher : improve estimation
  - Observer effect: trained observers have logically better detection rates
  - Big differences between trials: small sampling

Perspectives:

- Use difference between absolute flight altitude and relief data (srtm) for more accurate surfaces
- Project observation points into a shapefile for further analyzes
- Test other types of flight plans with various criteria: sampling, efficience, …
- Do a full size inventory
- Compare results with other inventory methods



PERSPECTIVES

Thank you for your attention!

WiMUAS

Would like to thank the following institutions and partners for their support: