2017 Field Season Report

"Conservation, connectivity, and conflict: A landscape ecology approach to understanding elephant movement and human-elephant conflict in northern Botswana"

Prepared for Jana Robeyst Trust Fund - 28 December 2017

By Erin Buchholtz, PhD Candidate at Texas A&M University

Recipient of December 2016 Fund Cycle

For my field season of 2016, I had outlined three main objectives:

1. Collect vegetation data for elephant habitat-use resource selection function
2. Collect local ecological knowledge to parameterize a resistance surface based on expert opinion
3. Collect and verify spatial- and meta-data for HEC in the region

As is often the case with field-work, exact methods changed. However, I was able to adequately achieve the stated objectives.

First, to collect vegetation data for elephant habitat-use resource selection function. I intended to do this by conducting transects and ground-truthing existing habitat data. I was able to complete the ground-truthing but did not carry out any transects. I found there was some available vegetation data already collected through a local research institution (Okavango Research Institute) which I can utilize.

Second, to collect local ecological knowledge to parameterize a resistance surface based on expert opinion. Instead of 4 representative villages with 10 experts, I interviewed 5-6 experts from 5 different villages: Samochima, Nxamasere, Tsodilo, Ikoga, and Etsha 6. Some village chiefs did not want to suggest 'experts' to interview, and for those villages I consulted with the Village Development Council (VDC). The VDC is a reliable source of information and knows the residents well, therefore it is assumed they recommended appropriate interviewees. For Tsodilo Village, I had difficulty in securing interviewees and had to return many times to the village. With certain obstacles, the interviews took longer than anticipated, but I was able to interview at least five individuals from each of the five villages. I hired Kelelafetse Phaladi from Nxamasere Village to assist with translation. I trained him on the interview methods and we were a successful team. I hand-transcribed the interview answers, using a coding system for the specific habitat and vegetation ranking questions. The transcribed interviews have been typed up and are now at the stage ready for analysis.

Third, to collect and verify spatial and meta-data for human-elephant conflict in the region. I was able to make copies of Problem Animal Control (PAC) reports from Gumare Department of Wildlife and National Parks (DWNP) for all of 2016 and for 2017 through July. Shakawe DWNP office did not want me to take their record book out of the office to make copies, so I hand-typed their records to effectively digitize them. These data were added to previously collected PAC data, completing a regional database of reported human-elephant conflict incidents. It was infeasible to collect GPS spatial data for the number of records which were missing it, and therefore I decided for analyses using this data it will be aggregated at the village level.

Next steps will be to analyze the data that was collected. I anticipate at least two published articles will result from the data I was able to collect using this funding. First, a paper on the local ecological knowledge and how it aligns with measured elephant habitat selection. Second, a paper on the spatio-temporal trends in reported human-elephant conflict in the region.

I was able to build up relationships with the local DWNP offices and with village leaders during this field season. I gave feedback to the chiefs of each village and to the offices, and will continue to provide feedback to them as my research progresses. I also presented this data at the Maun Research Talks in Maun, Botswana, and at the Wildlife and Fisheries Sciences Departmental Seminar at Texas A&M University. The Jana Robeyst Trust Fund was acknowledged in both presentations and will be in future works done with these data. I have attached one of the presentations involving in part data collected in 2017 for your viewing (although please contact me before using any of the information in that presentation for any other purpose).

Human-elephant conflict
Western Okavango Panhandle, Botswana

Erin Buchholtz - PhD Candidate, Fitzgerald Lab

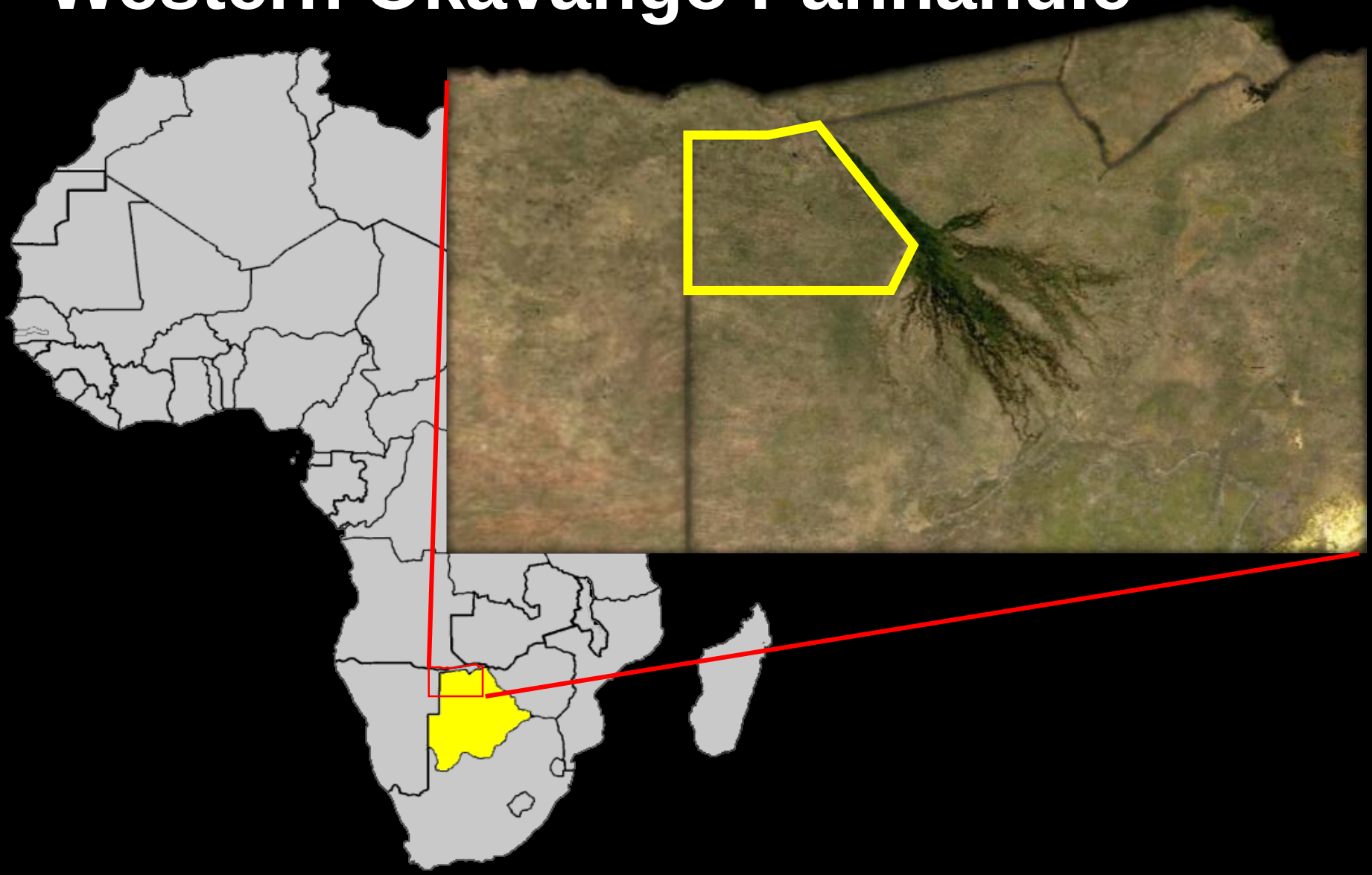
EEB – ABS – WFSC

WFSC Lunchtime Seminar, October 6, 2017

Overview

- Western Okavango Panhandle
- Human and elephant land-use and conflict as a study system
- Spatial & temporal patterns

Western Okavango Panhandle



Overall research question:

How does landscape connectivity affect elephant movement patterns and therefore local occurrence of HEC?

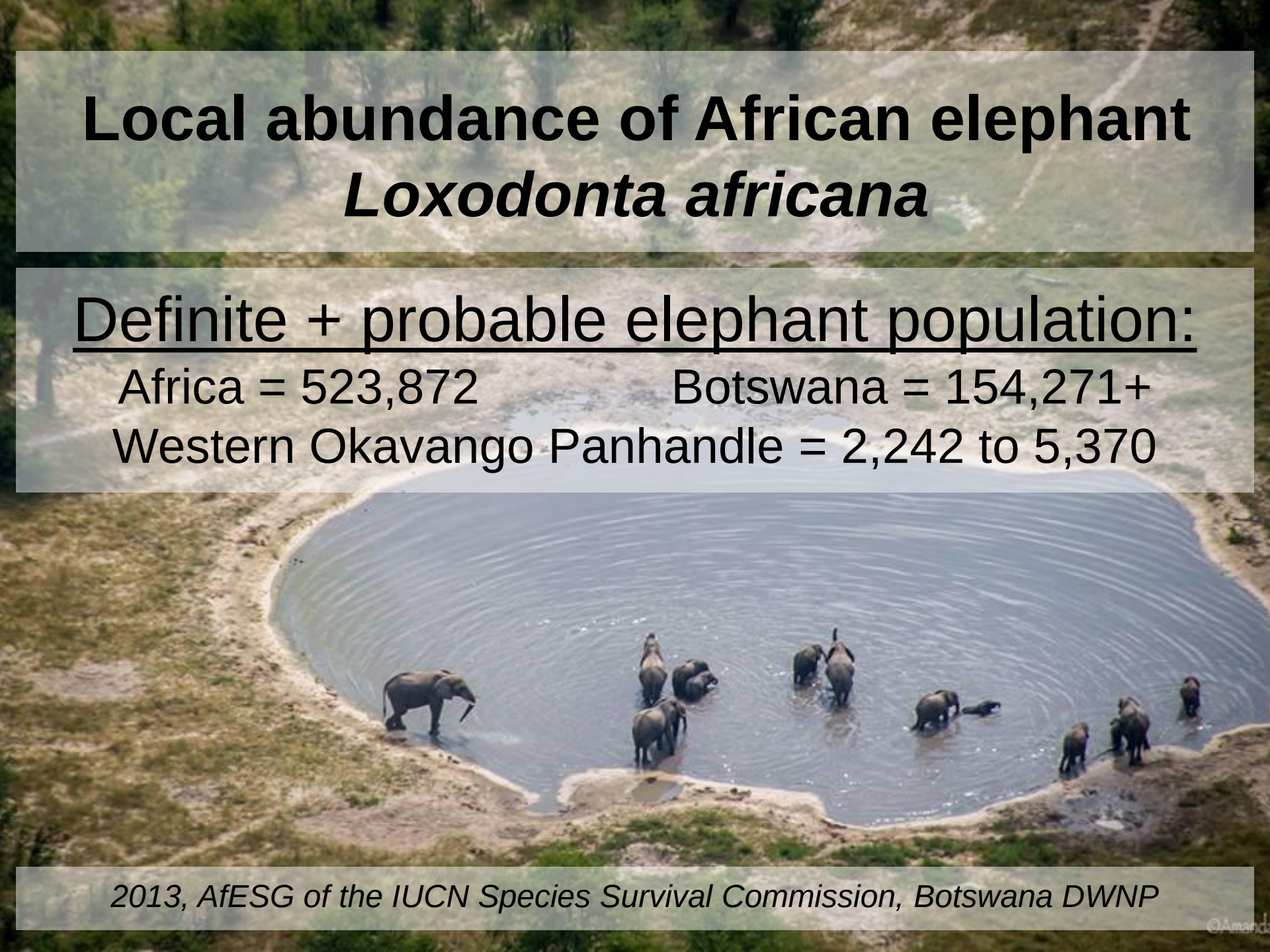
- Characterize elephant utilization of the landscape
- Estimate landscape connectivity and resistance for elephant movement
  - GPS collars
  - Local ecological knowledge
- Identify spatial and temporal patterns of HEC

Local abundance of African elephant *Loxodonta africana*

Definite + probable elephant population:

Africa = 523,872 Botswana = 154,271+

Western Okavango Panhandle = 2,242 to 5,370



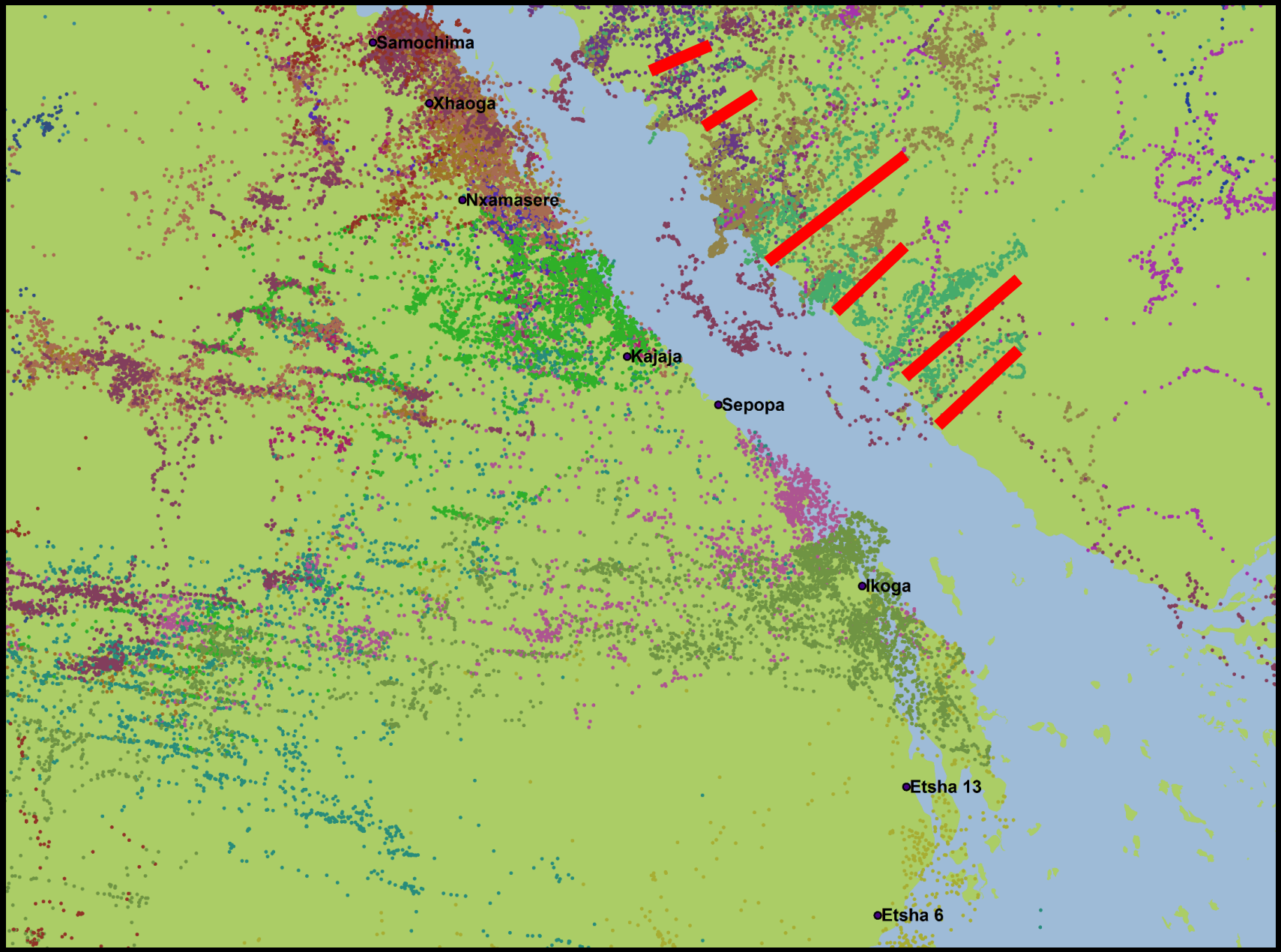
2013, AfESG of the IUCN Species Survival Commission, Botswana DWNP

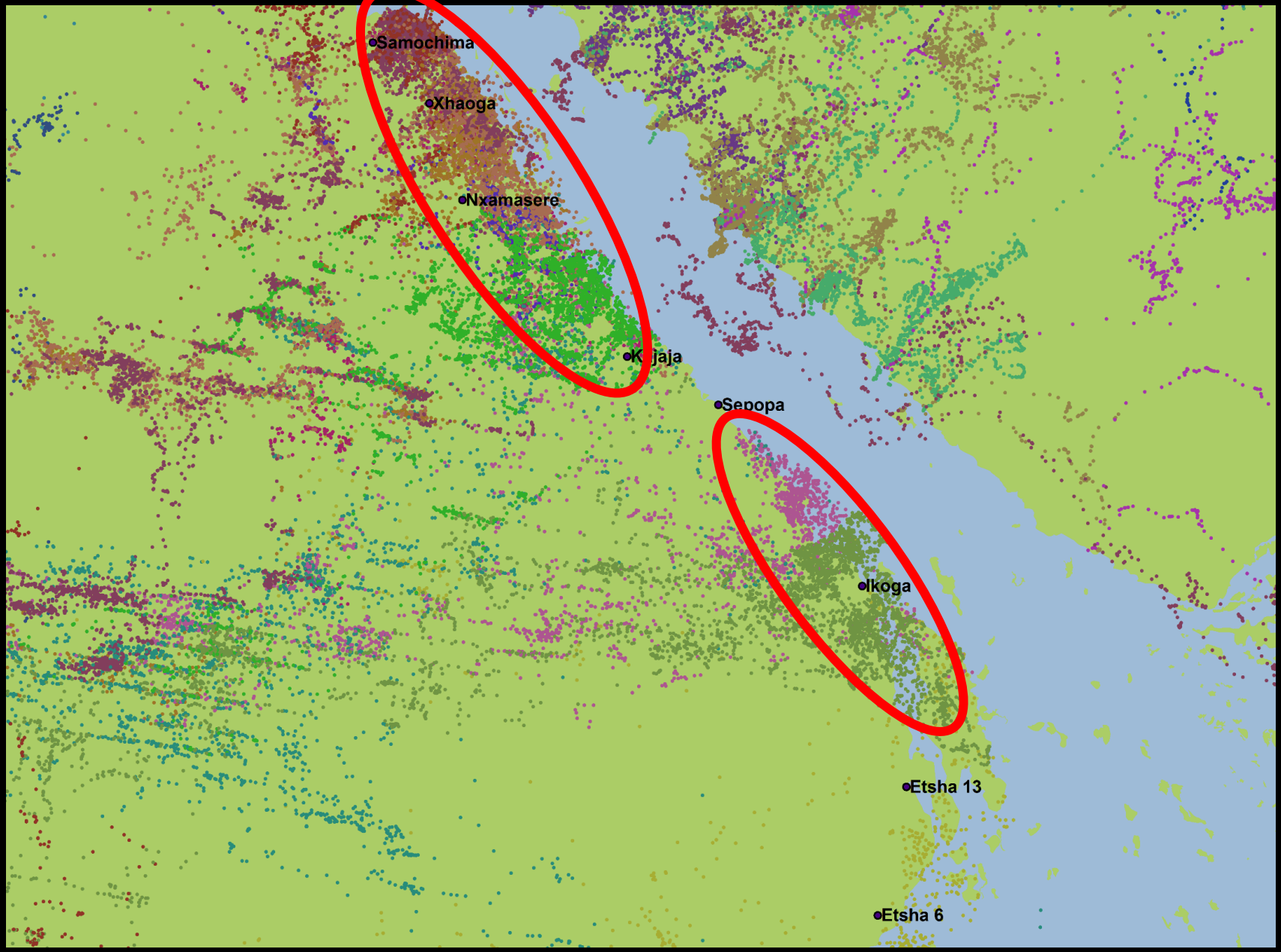
A diverse population of people that are in many ways vulnerable

"remote, sparsely populated, and lacking access to the kinds of services, markets, and opportunities available elsewhere in the nation" – *EcoexistProject.org*

Challenge & research motivation

- Humans and elephants must **co-exist** on the landscape
- Patterns of elephant movement, human development, and human-elephant interactions can reveal drivers of conflict
- Management and conservation efforts must incorporate patterns and drivers of conflict in addition to symptomatic approaches
- Landscape connectivity can be a tool to understand and predict patterns and conflict


Samochima
Xhaoga
Nxamasere
Kajaja
Sepopa
Ikoga
Etsha 13
Etsha 6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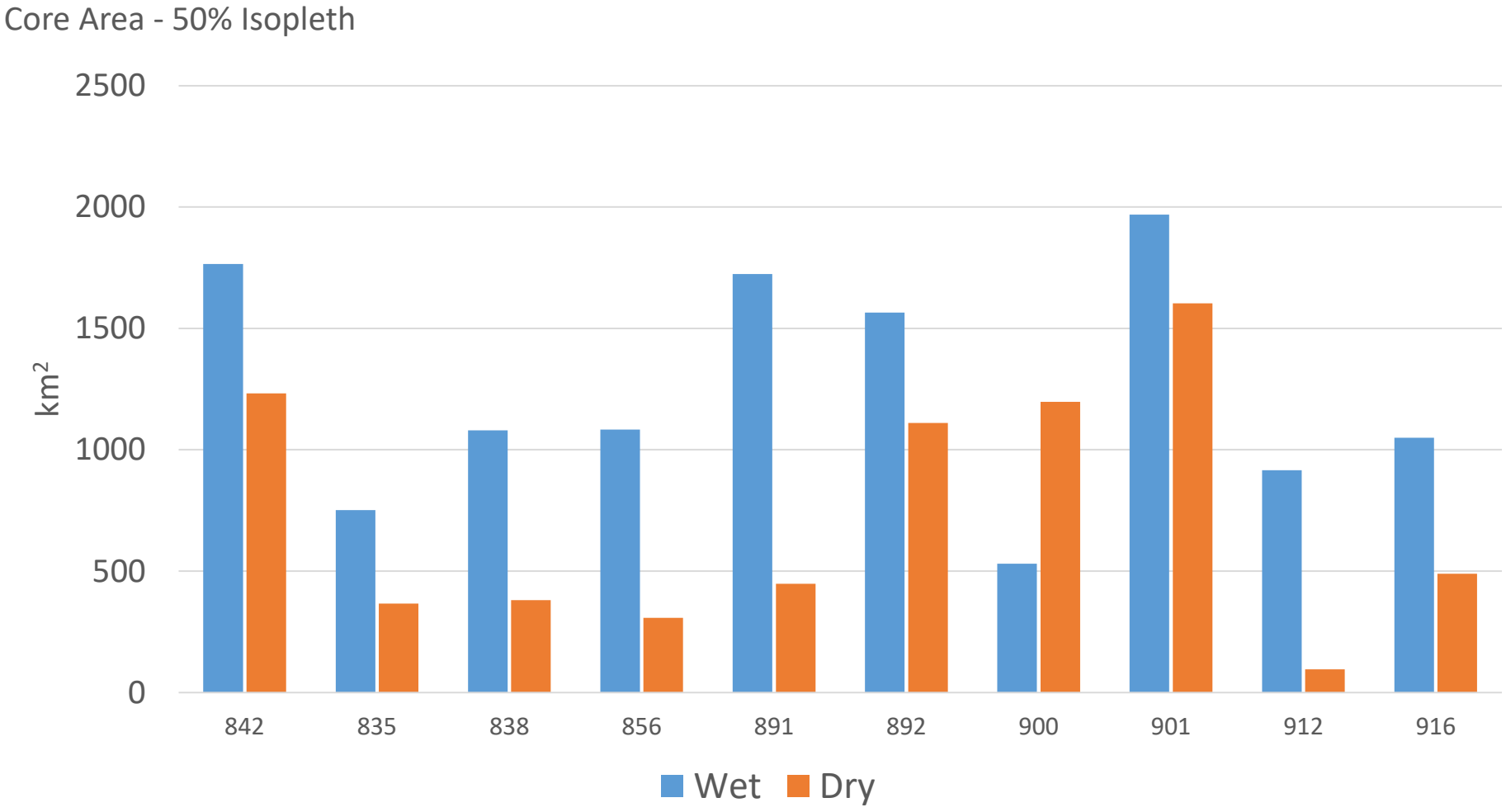
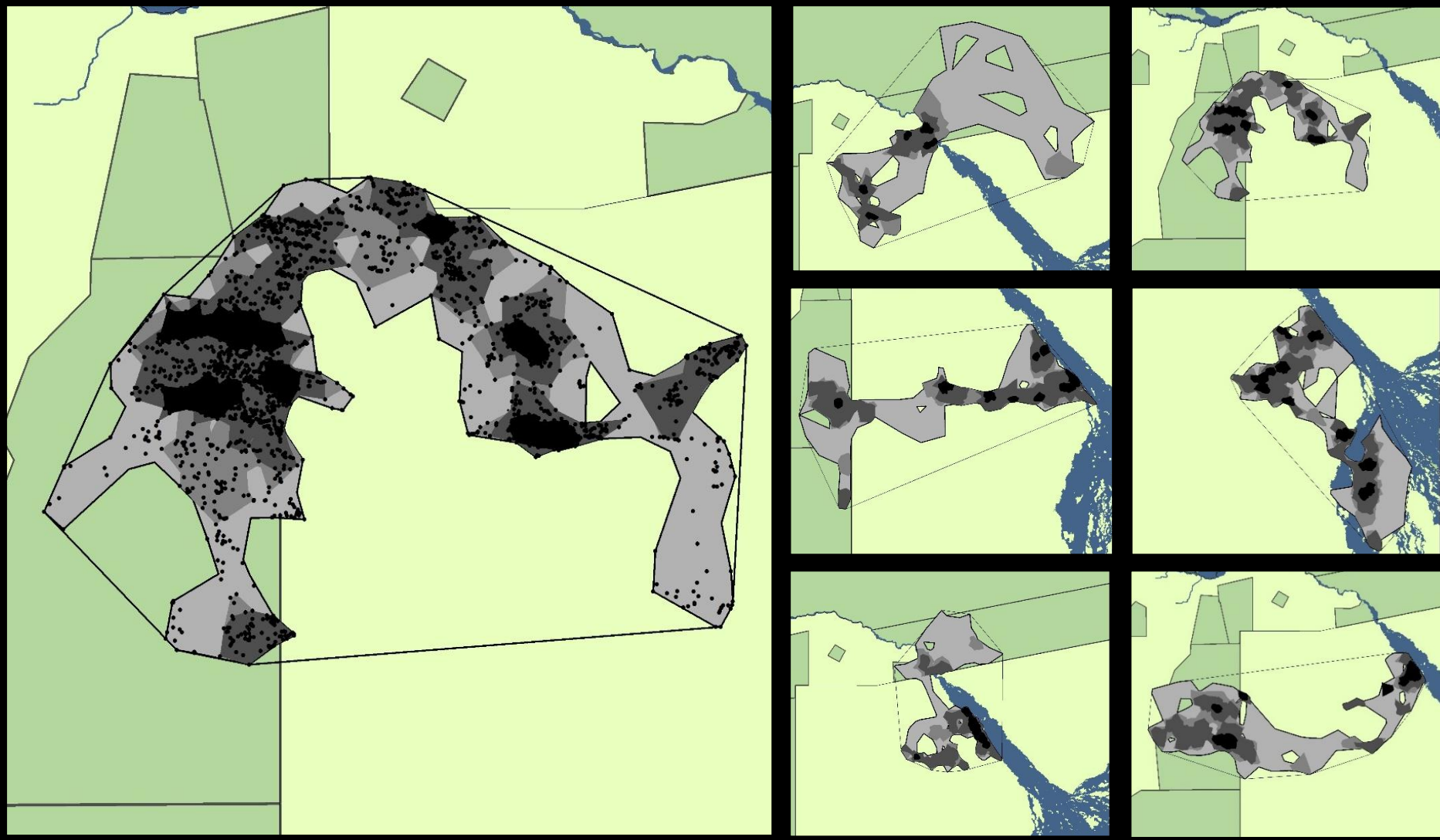
Bulls' Seasonal Distribution



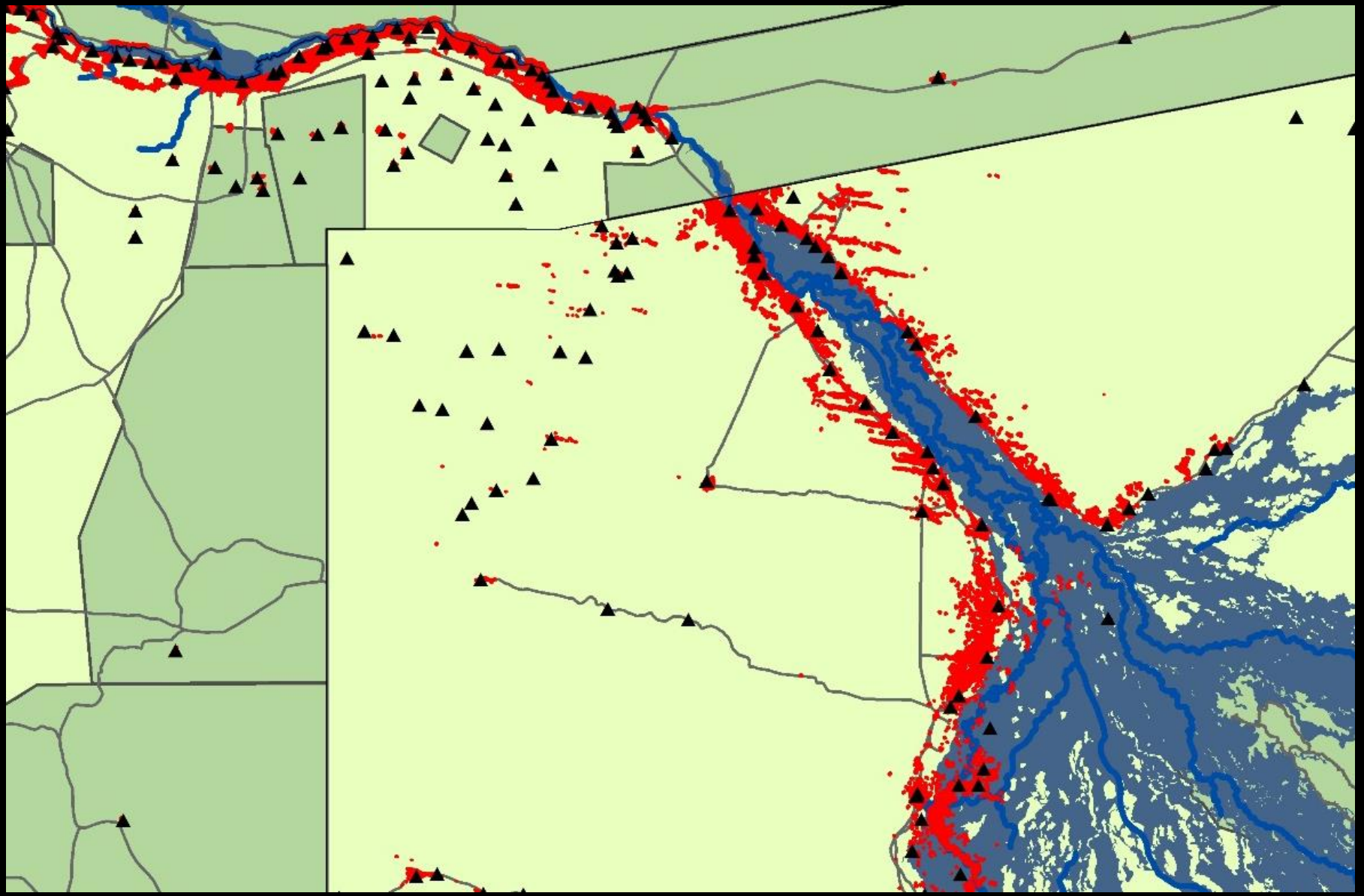
Wet season distribution significantly larger than dry season ($p < 0.009$)



Individual year-round utilization ranges (α-LoCoH)

2,455 – 6,653 km^2

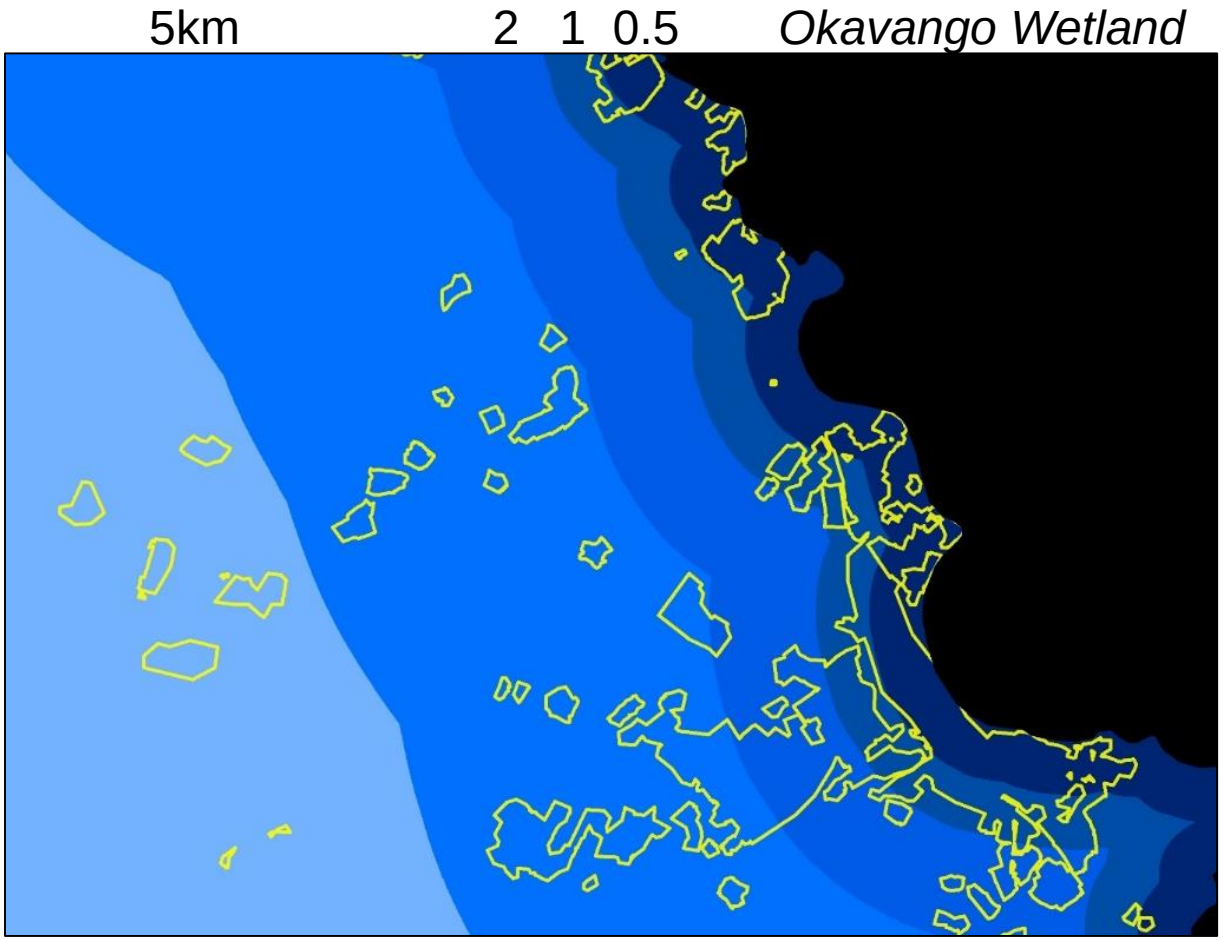
Human settlements and development



Agriculture and development

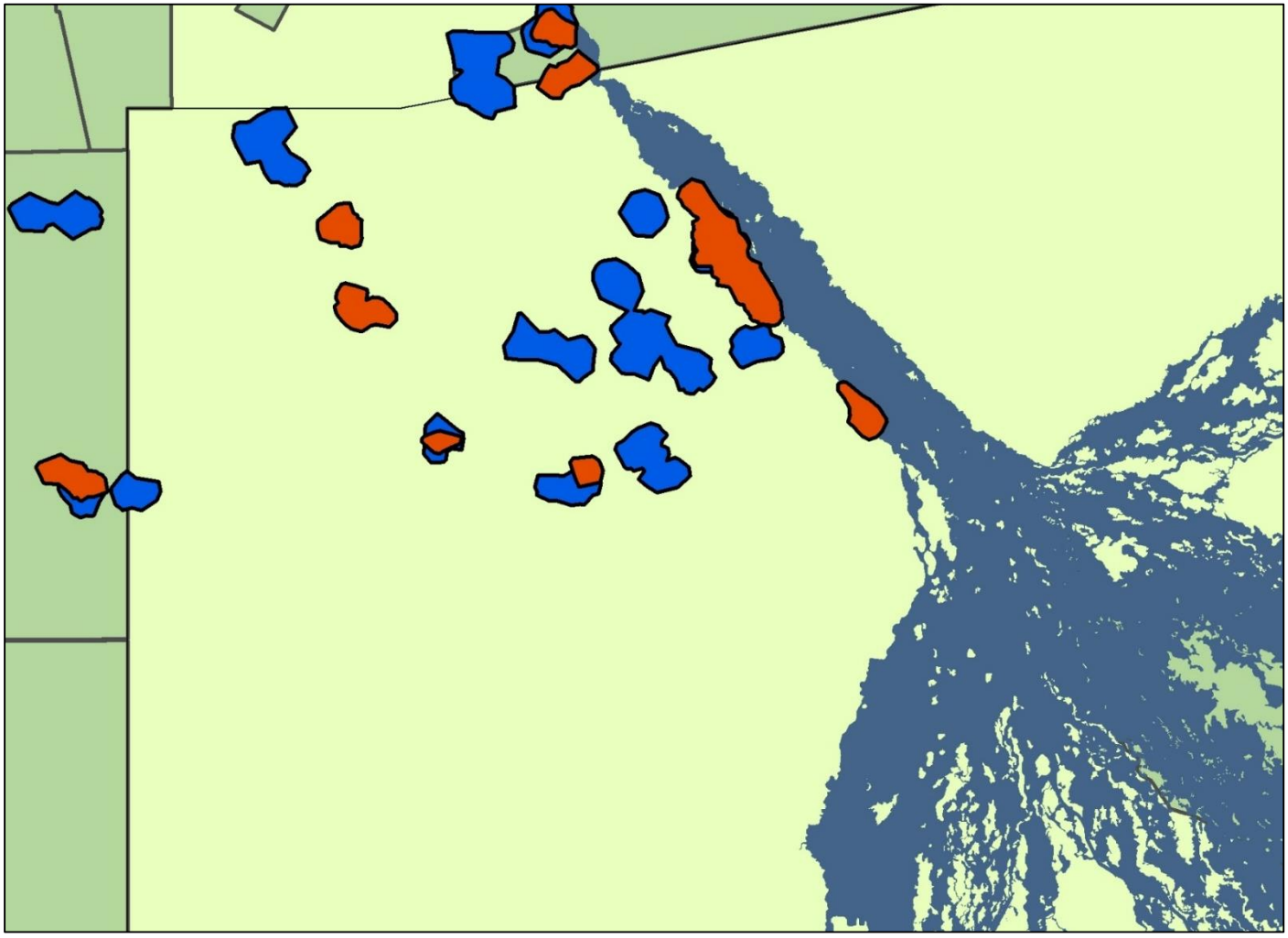
Most development (89%) found within 10 km of water

- 31% found <1 km
- 53% found < 2 km
- 82% found < 5 km
- Only 6% development found 30+ km
- **Consequences = human-elephant interactions around water**



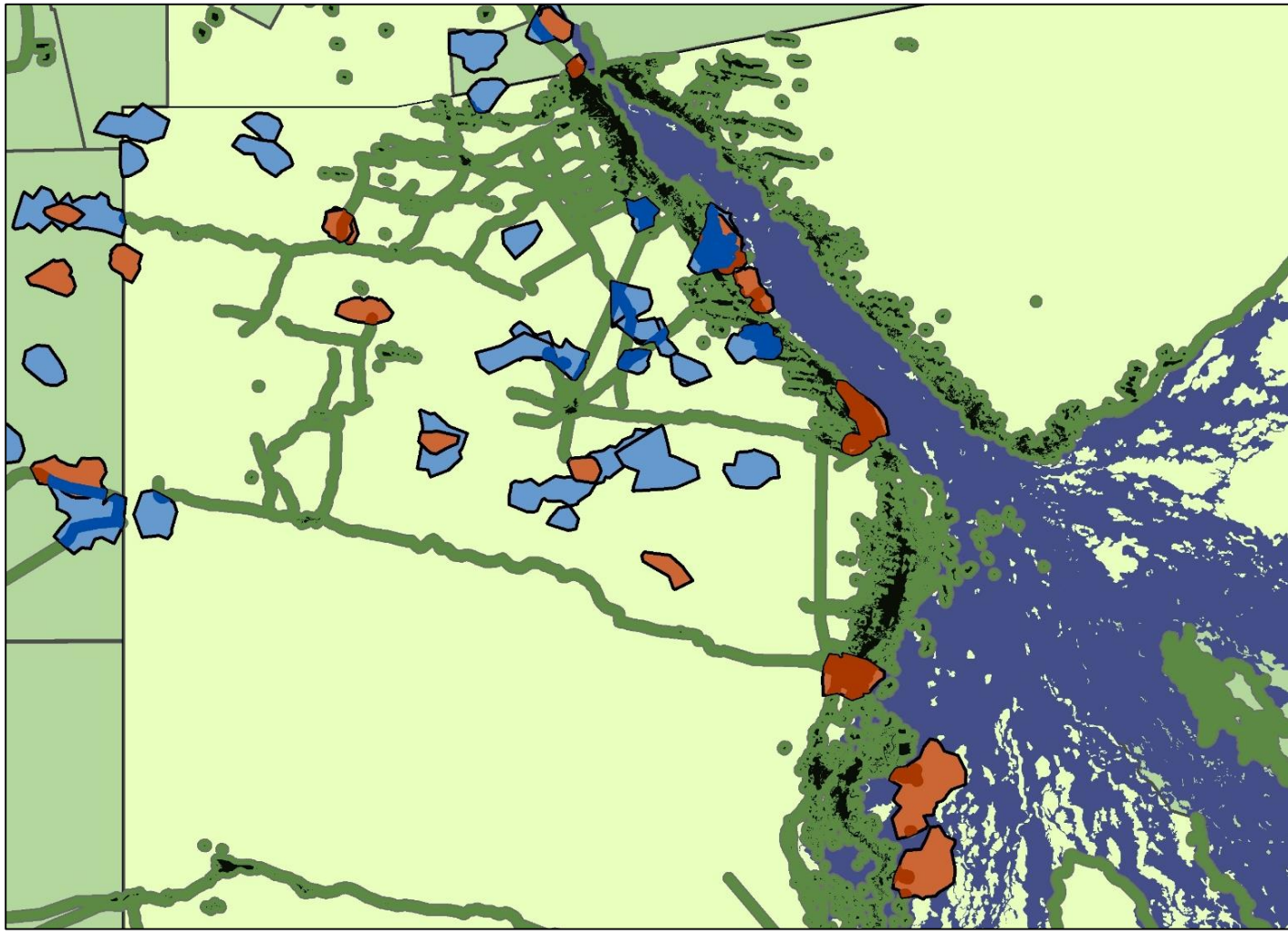
Elephants and development

- Wet season core areas are broader, more dispersed
- Dry season core areas are mostly along water



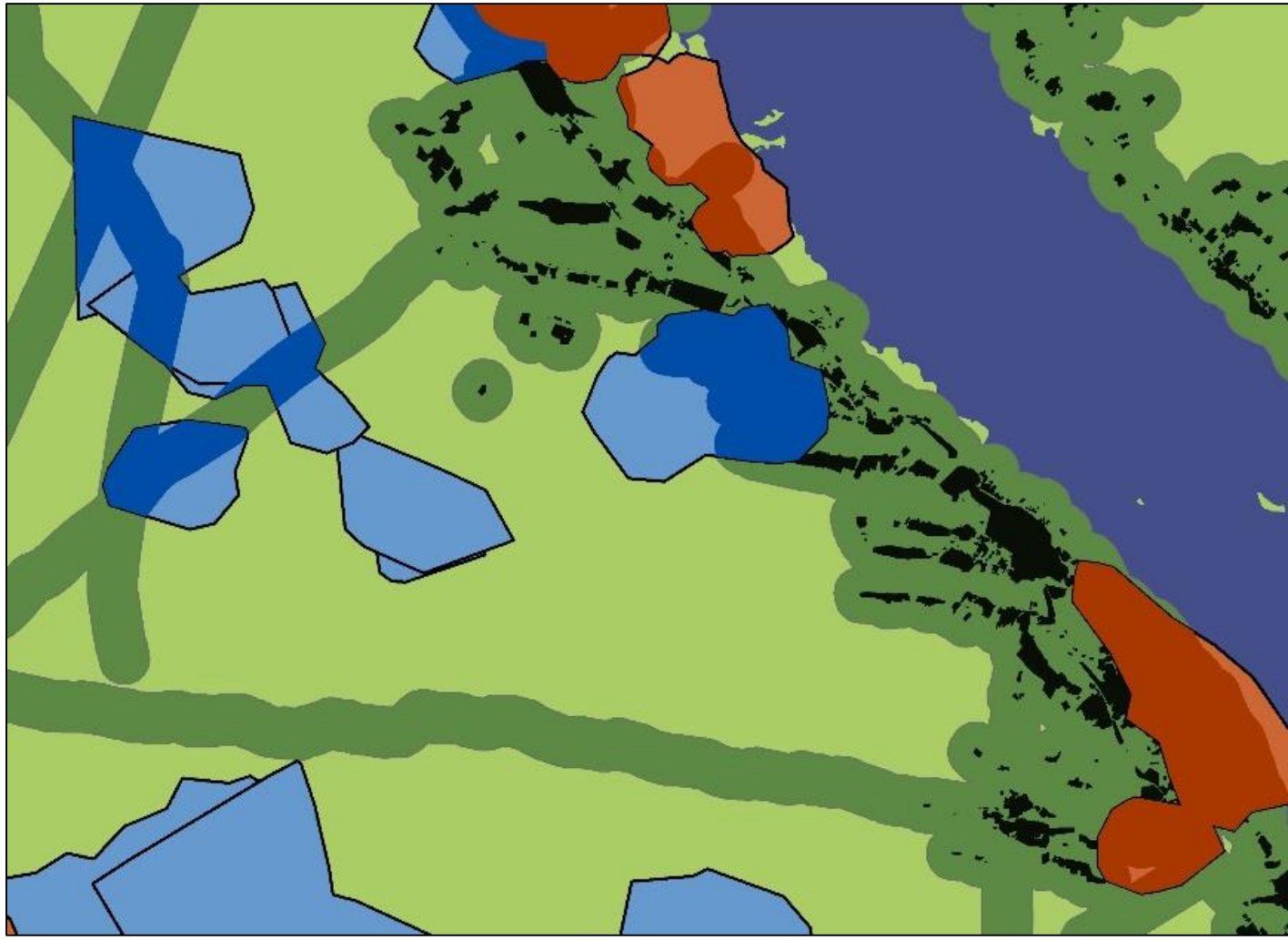
Elephants and development

- Development and roads + 1km buffer
- Up to 30% of core areas overlap with human development

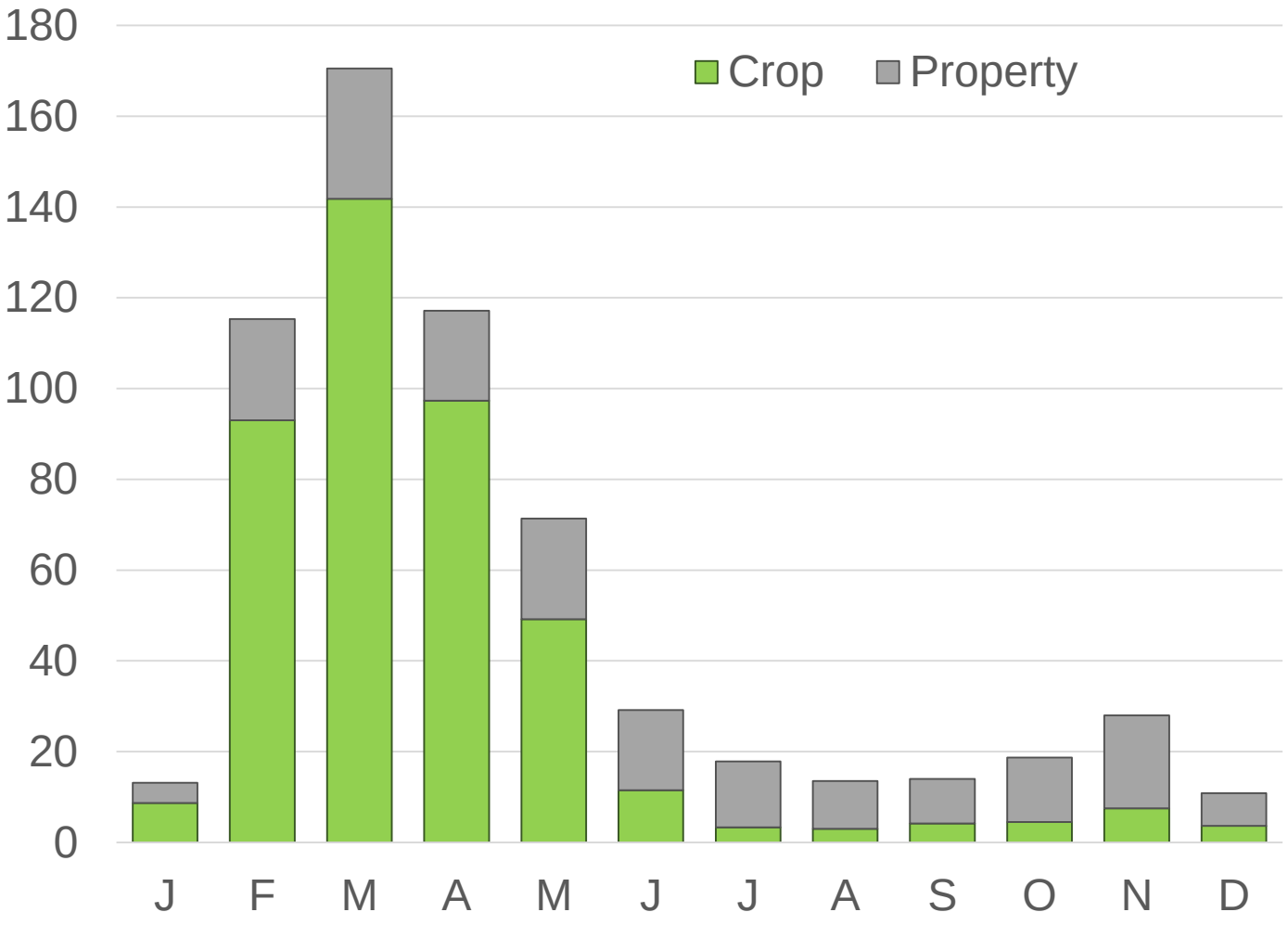


Elephants and development

- In dry season, H-E overlap increases (*50% core, $p < 0.009$*)
- The overlap in the dry season increases 9 - 40% *(mean 22%)*

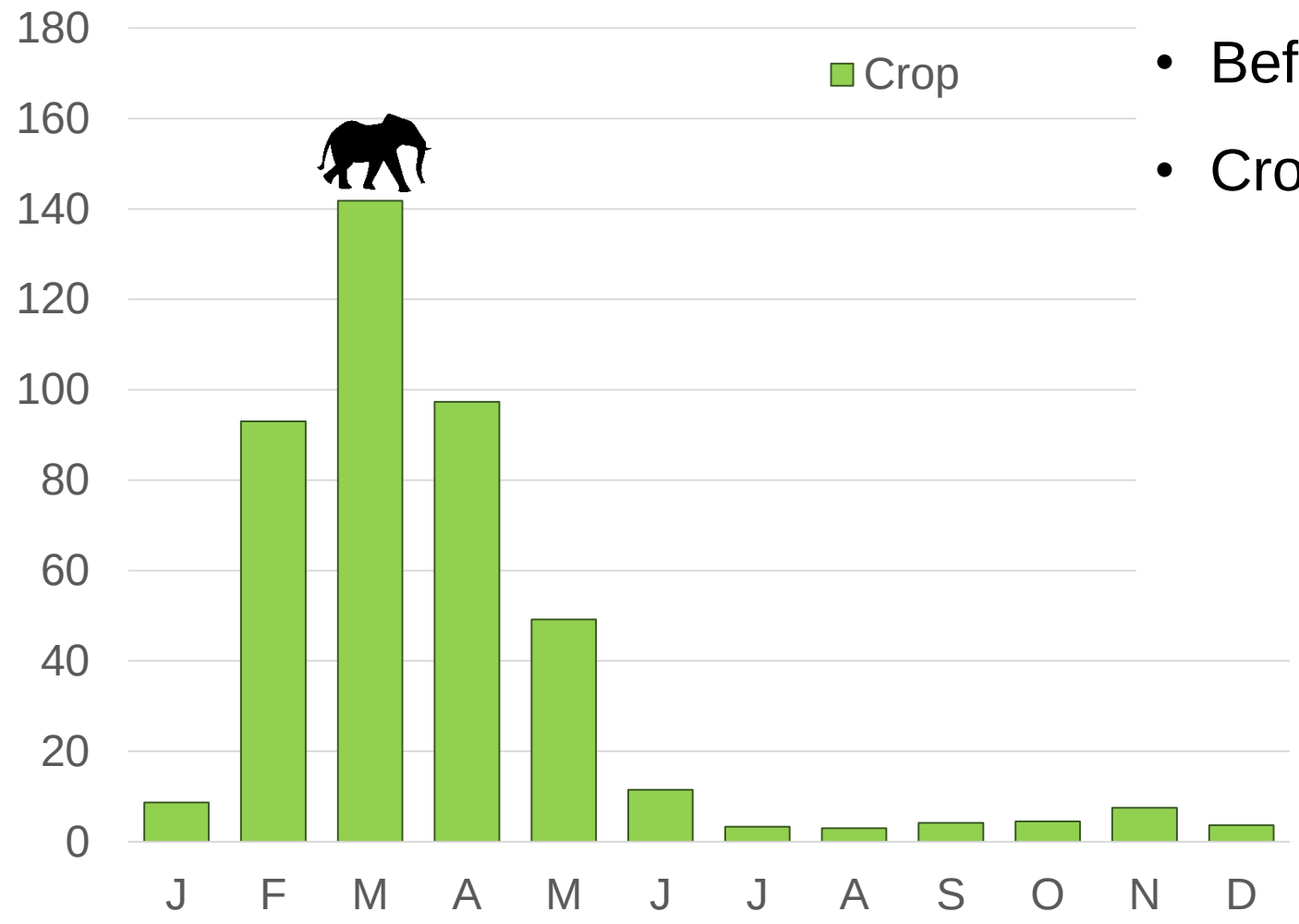


People experience conflict year-round



Reported PAC Incidents: Monthly averages 2008-15

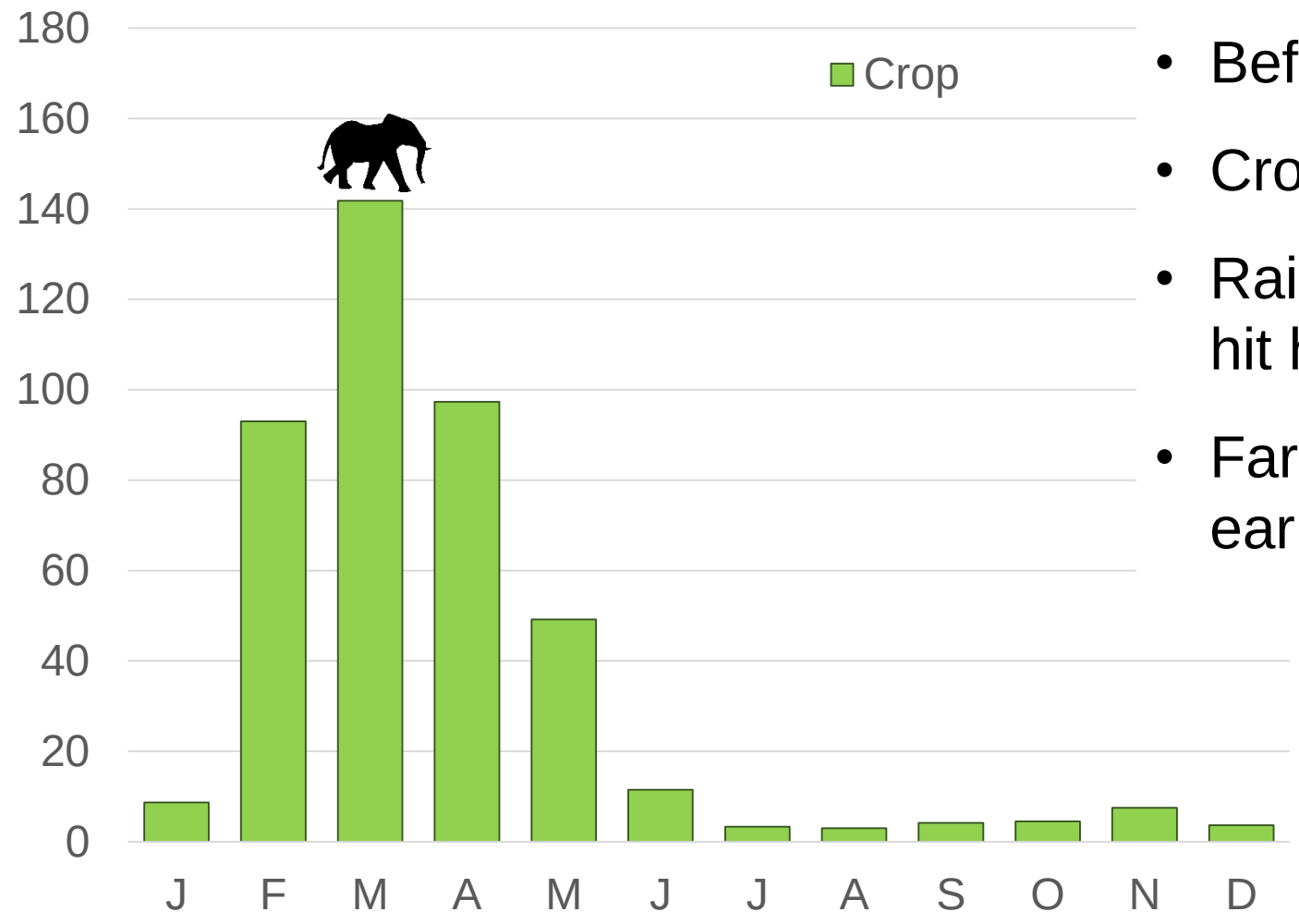
Reported crop raids peak in March



- Before rains end
- Crops are maturing

Reported PAC Incidents: Monthly averages 2008-15

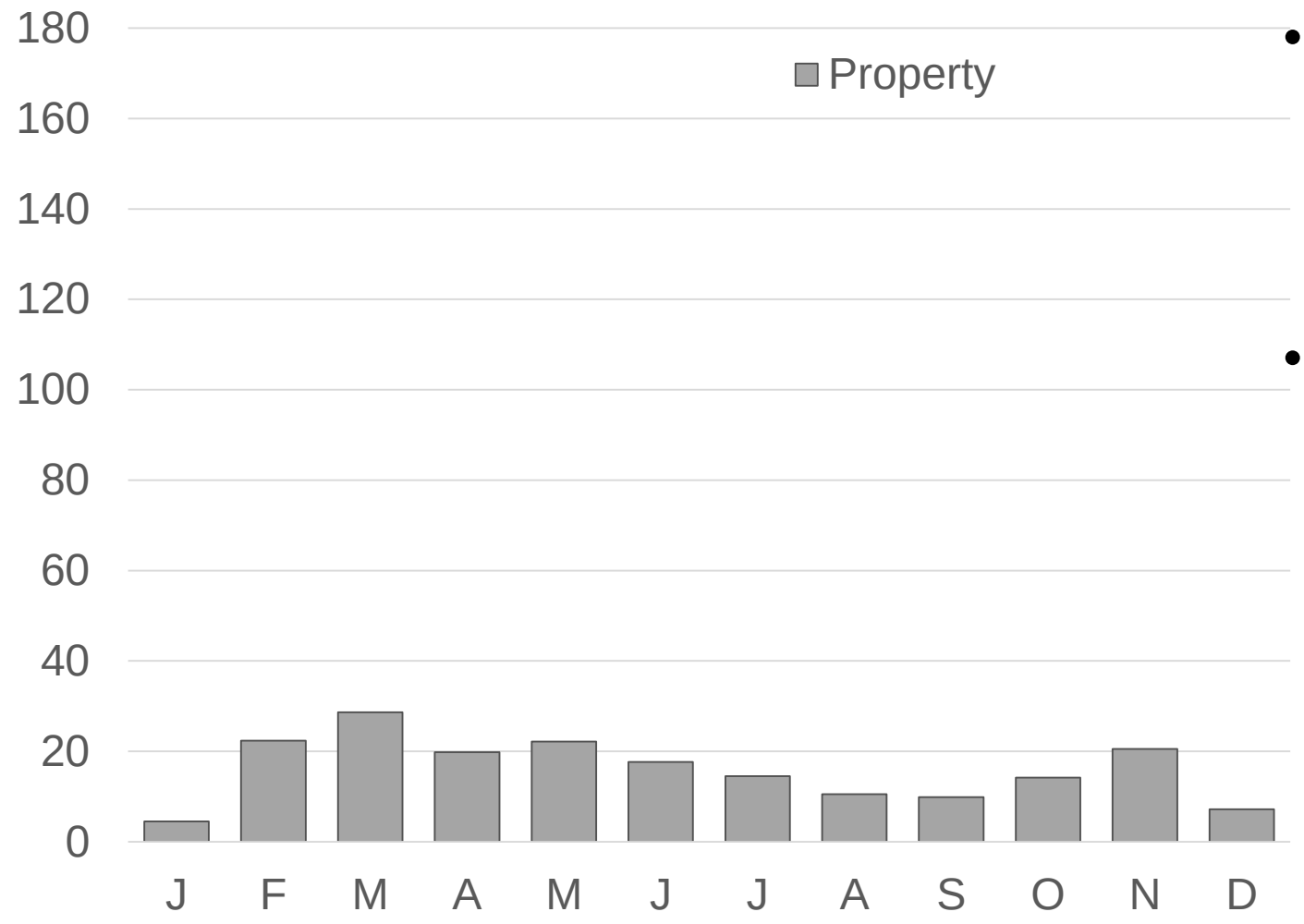
Reported crop raids peak in March



- Before rains end
- Crops are maturing
- Raids pre-harvest hit hard
- Farmers harvesting early at a loss

Reported PAC Incidents: Monthly averages 2008-15

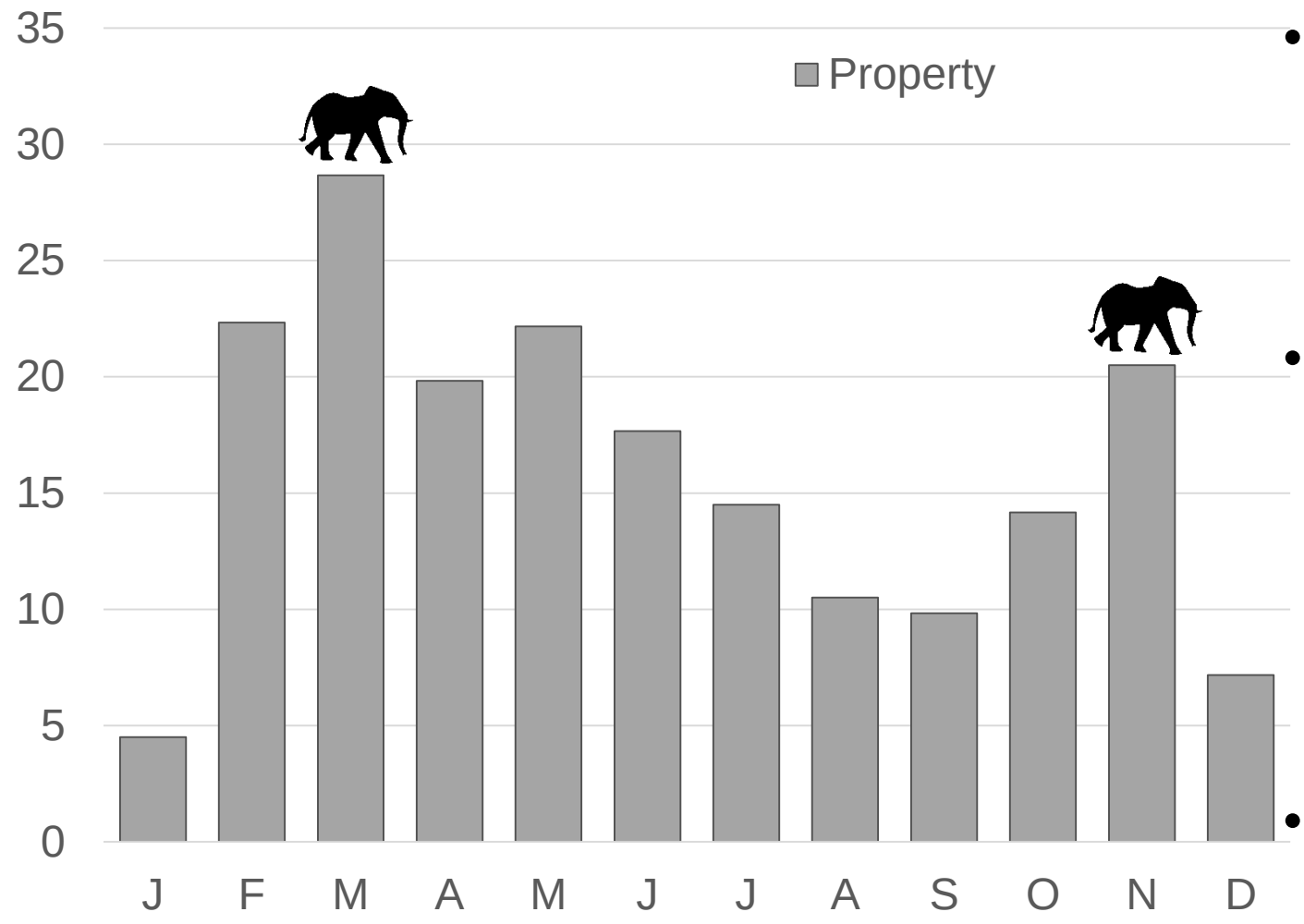
Property damage throughout the year



Reported PAC Incidents: Monthly averages 2008-15

- Constant source of conflict, risk, and fear
- Damage to: fences, jojo tanks, huts, engines, pipes, canoes & donkey carts

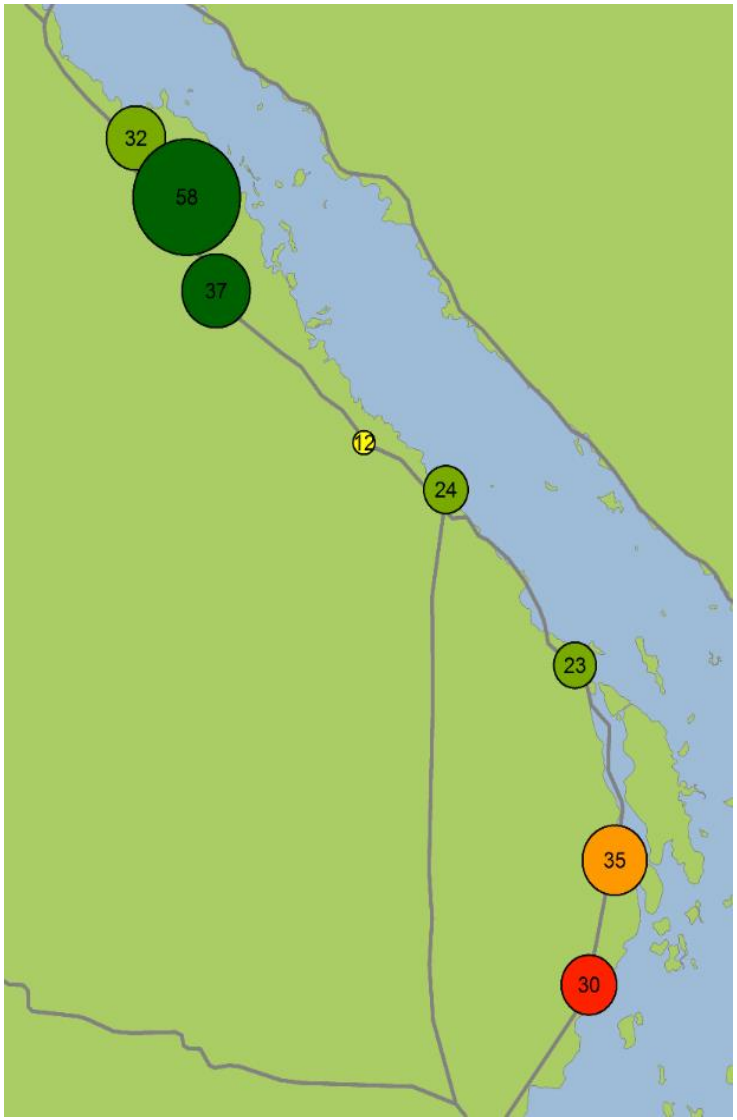
Property damage throughout the year



Reported PAC Incidents: Monthly averages 2008-15

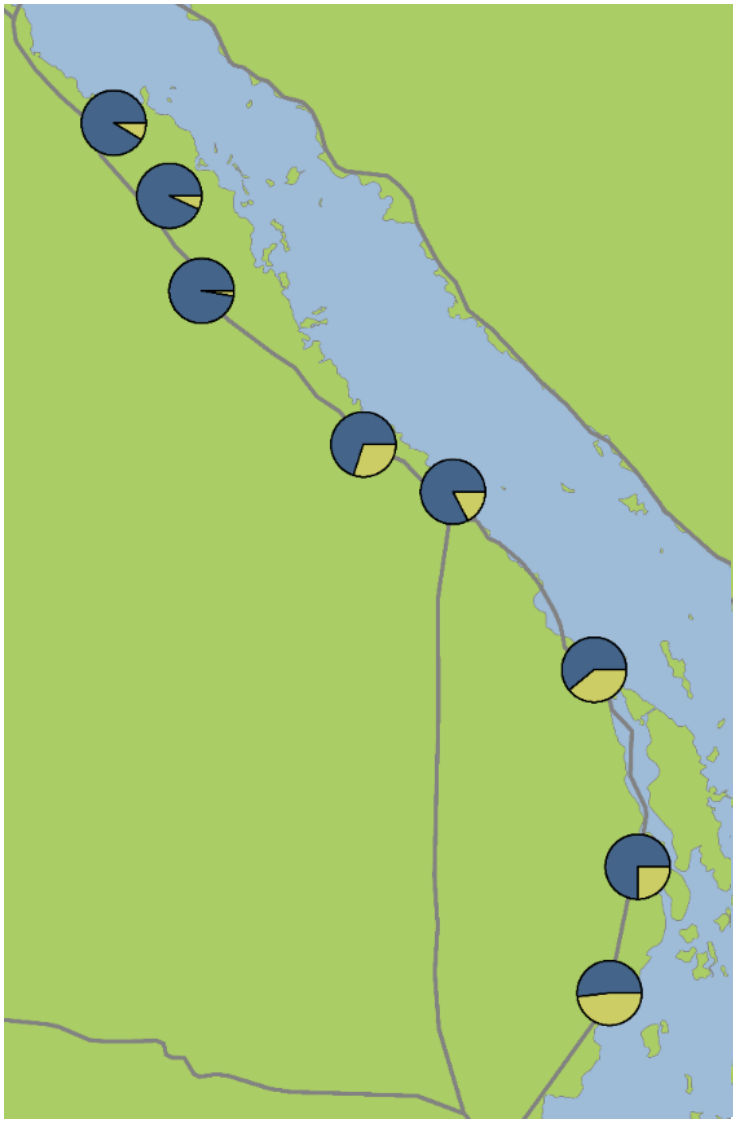
- Constant source of conflict, risk, and fear
- Damage to: fences, jojo tanks, huts, engines, pipes, canoes & donkey carts
- Slightly bimodal

Frequency and severity of crop raids, 2016



Village	Reported Raids	Unique Fields	Ave Dmg/raid
Samochima	32	23	1317 m^2
Xhaoga	58	33	525 m^2
Nxamasere	37	24	320 m^2
Kajaja	12	8	1808 m^2
Sepopa	24	18	1076 m^2
Ikoga	23	16	1112 m^2
Etsha 13	35	25	2439 m^2
Etsha 6	30	23	10660 m^2

Frequency and severity of crop raids, 2016



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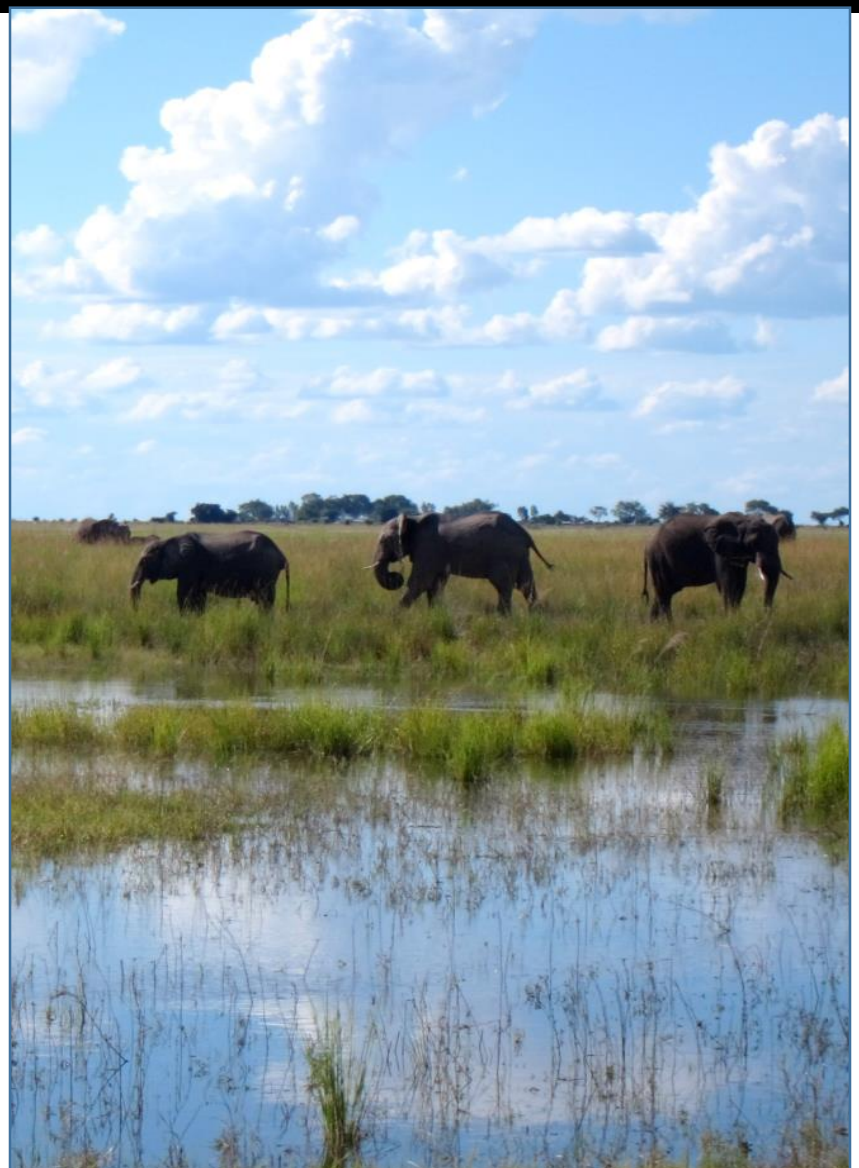
Preliminary Findings & Conclusions

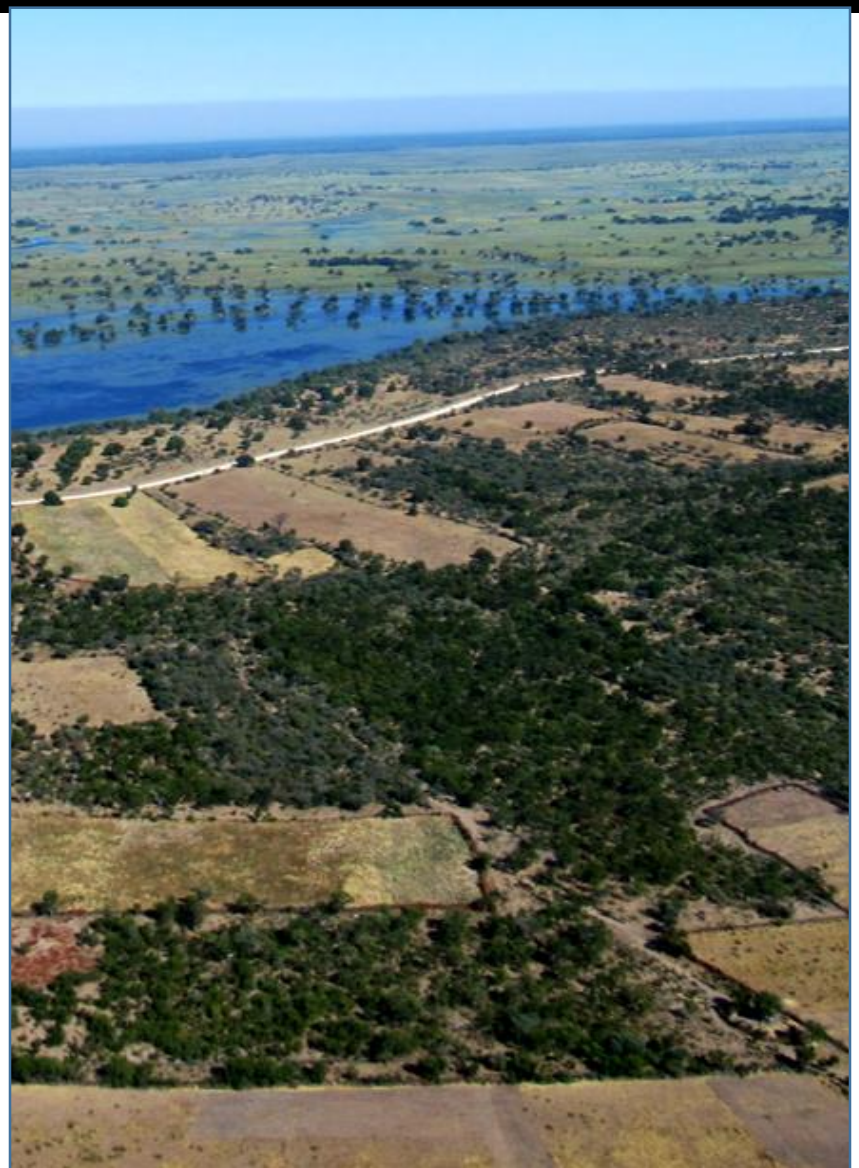
- Regional distribution of humans & elephants
- Monthly patterns of elephant PAC 2008-2015
- Consequences for connectivity and conflict

Regional distribution of humans & elephants



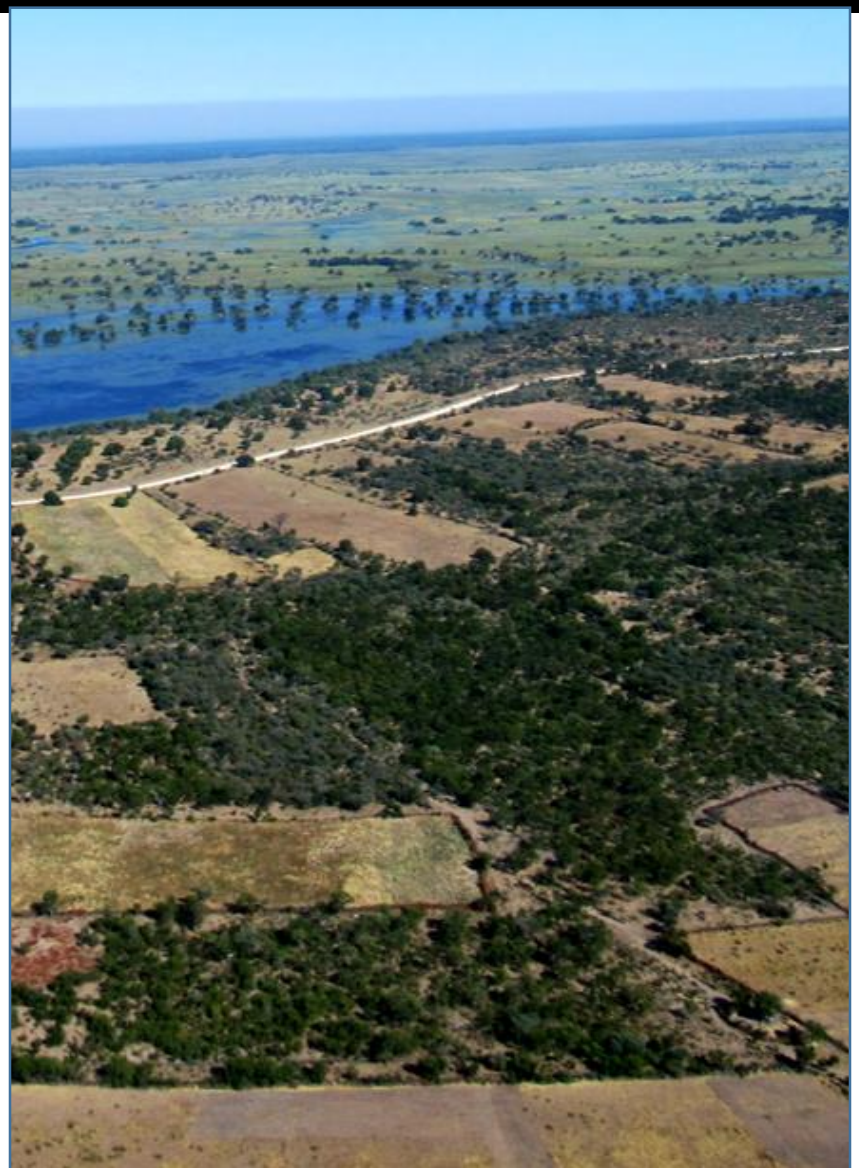
- Elephants use a wide range of area within the region
- Elephant core areas are smaller and more concentrated near the water during dry season
- Human development is overwhelmingly located near the water
- Elephant core areas overlap with human development, leading to potential interactions & conflict

Monthly patterns of elephant PAC



- Annual peak in crop raids
- Bimodal peak in property damage
- Northern villages report more frequent, less severe raids by bulls
- Southern villages report less frequent, more intense raids by families

Connectivity and Conflict



- Variable landscape features likely influence elephant movement
- Seasonal water needs drive overlap in human-elephant land use
- Identifying and maintaining connectivity crucial for reducing spatial and temporal human-elephant overlap, and therefore conflict

Thanks!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JANA ROBEYST TRUST FUND
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