

# Designing Landscapes of Mixed Uses for Sustainable Elephant Population Growth

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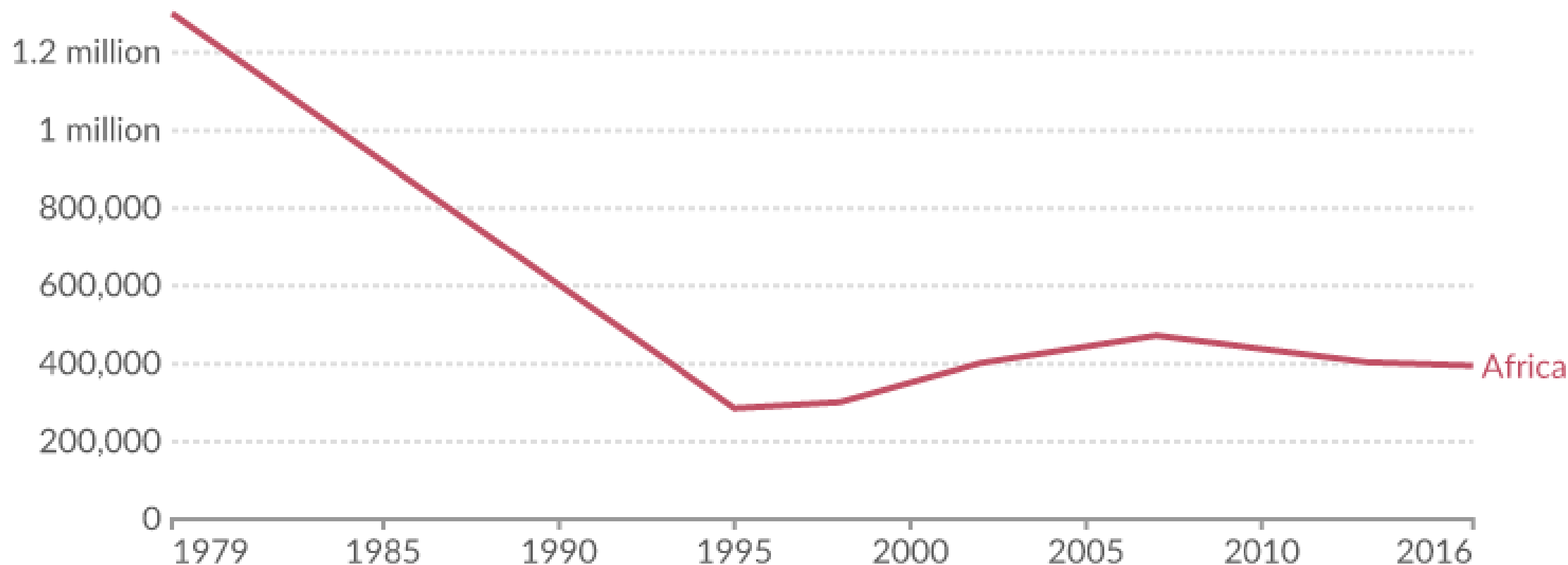


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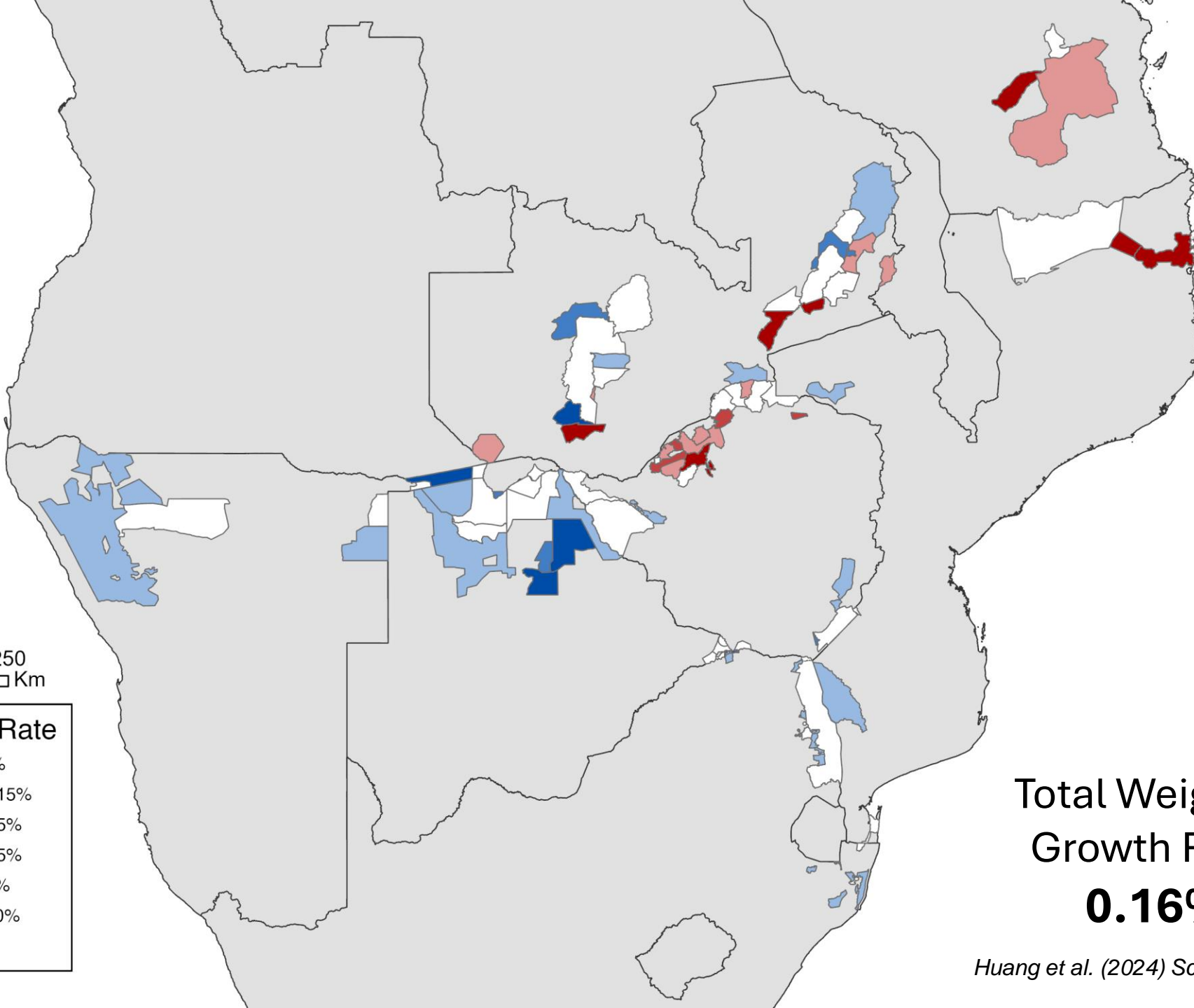
# Number of African elephants

Our World  
in Data

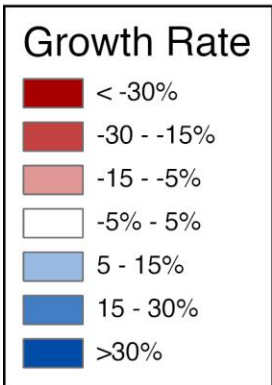


Data source: African Elephant Specialist Group (AfESG); Douglas-Hamilton (1979)

OurWorldInData.org/biodiversity | CC BY

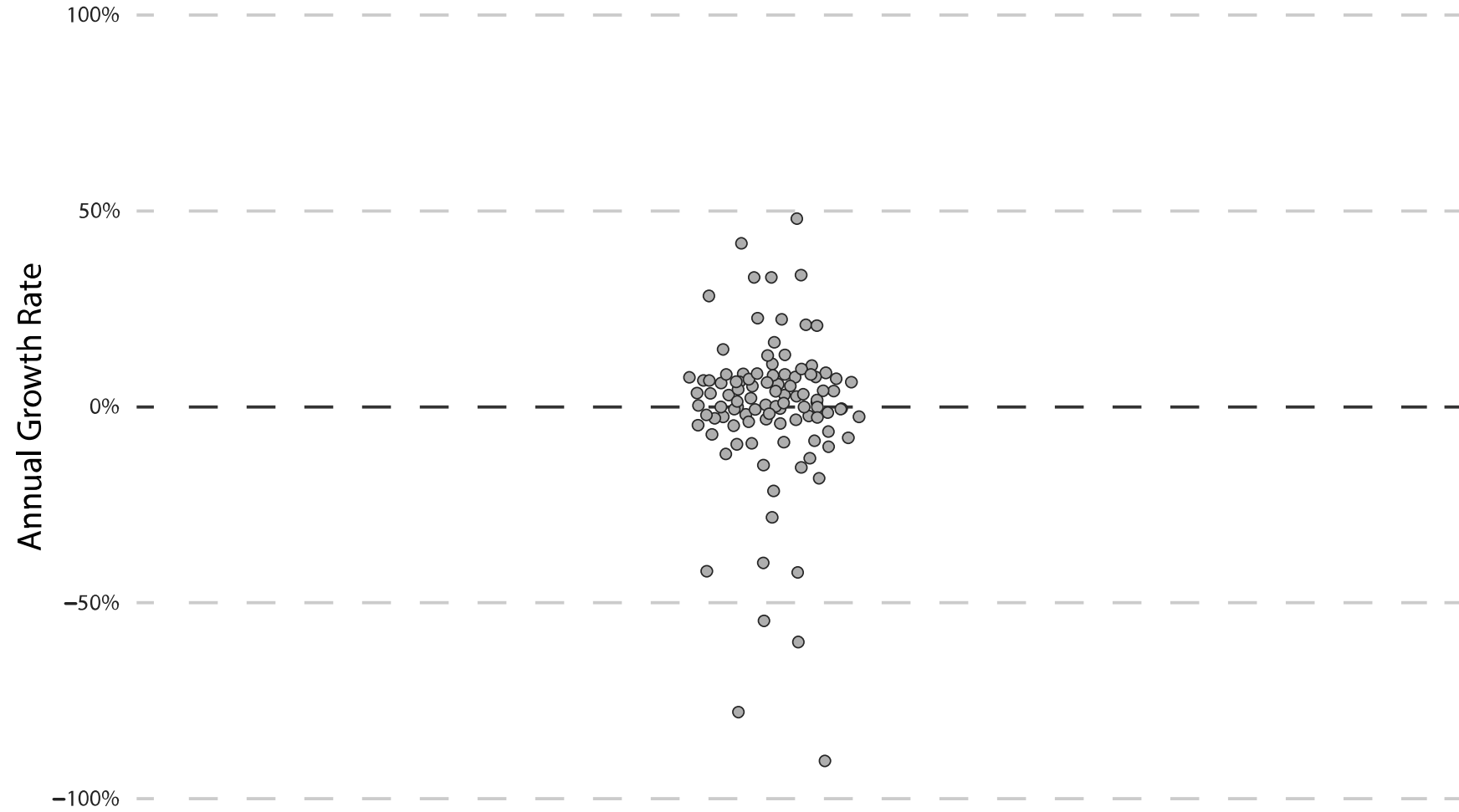


0 125 250  
Km

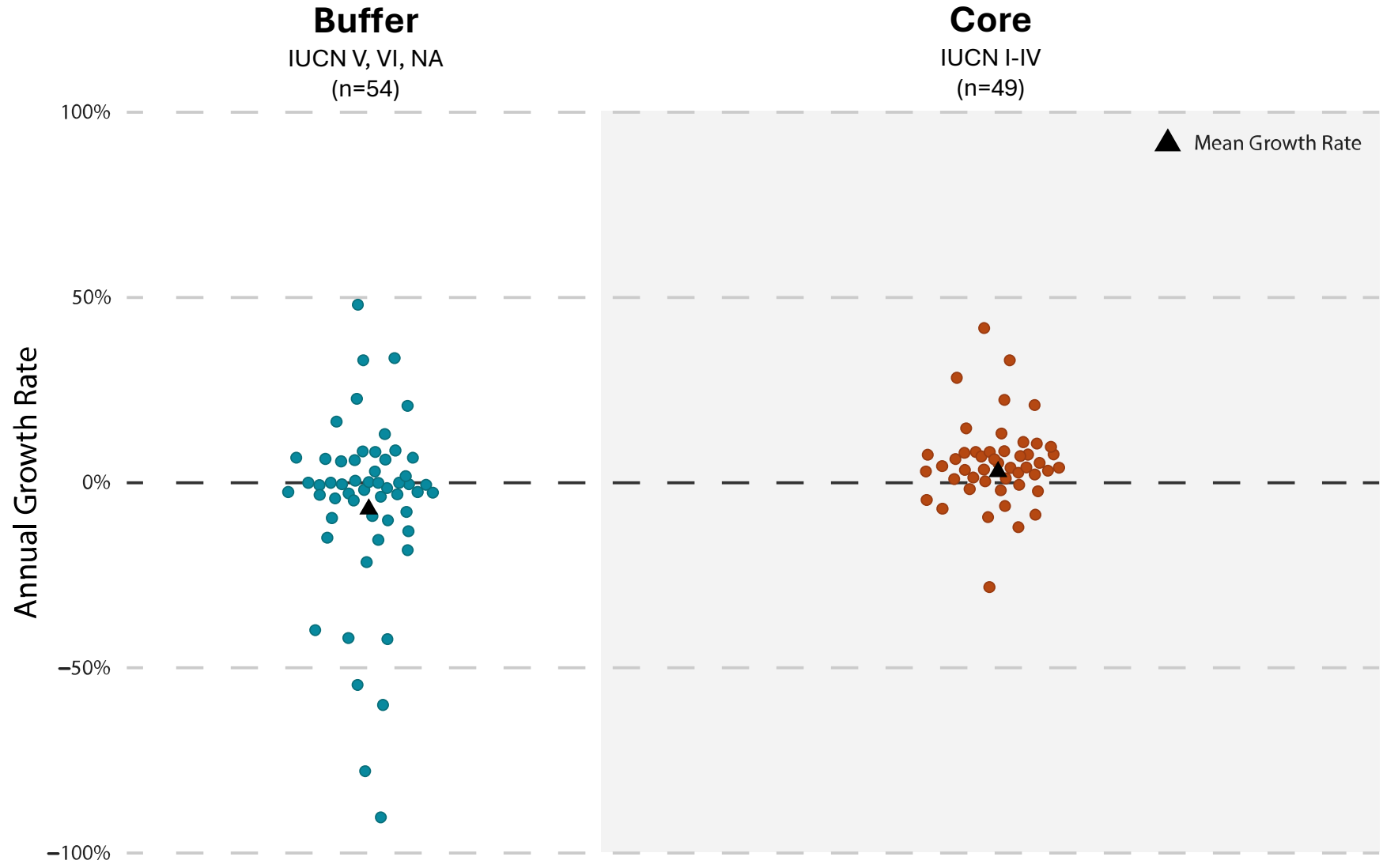


Total Weighted  
Growth Rate:  
**0.16%**

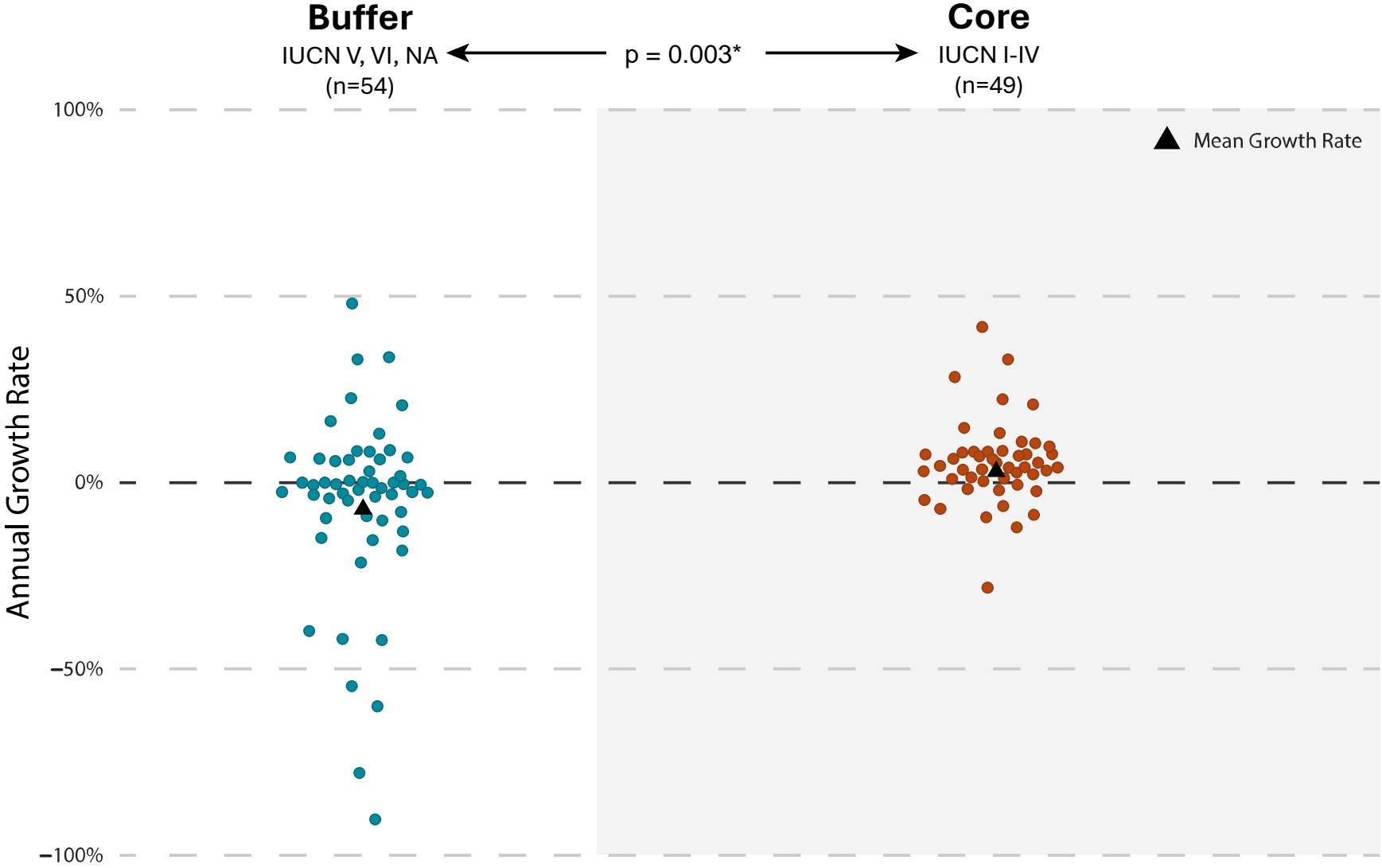
*Huang et al. (2024) Science Advances*

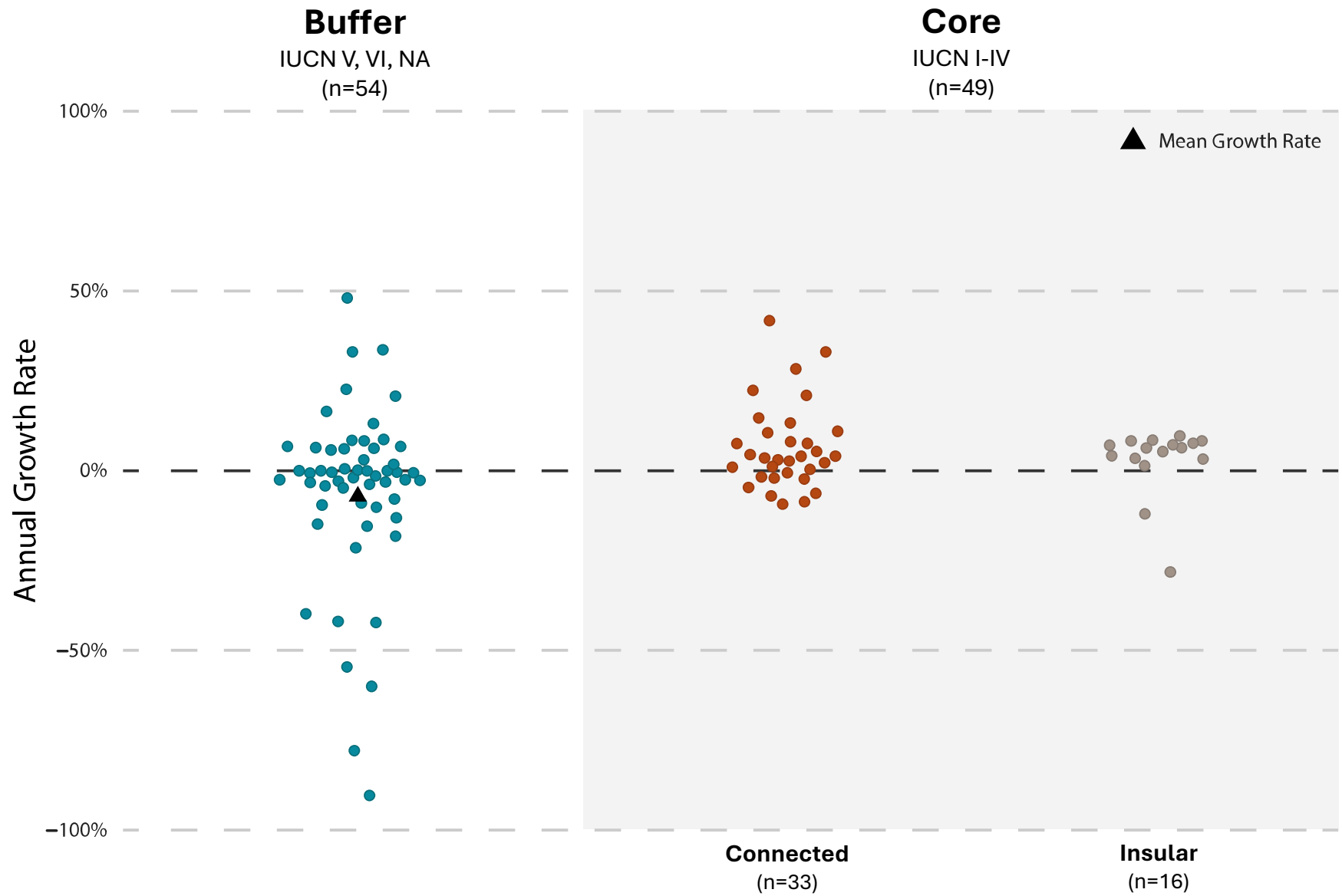


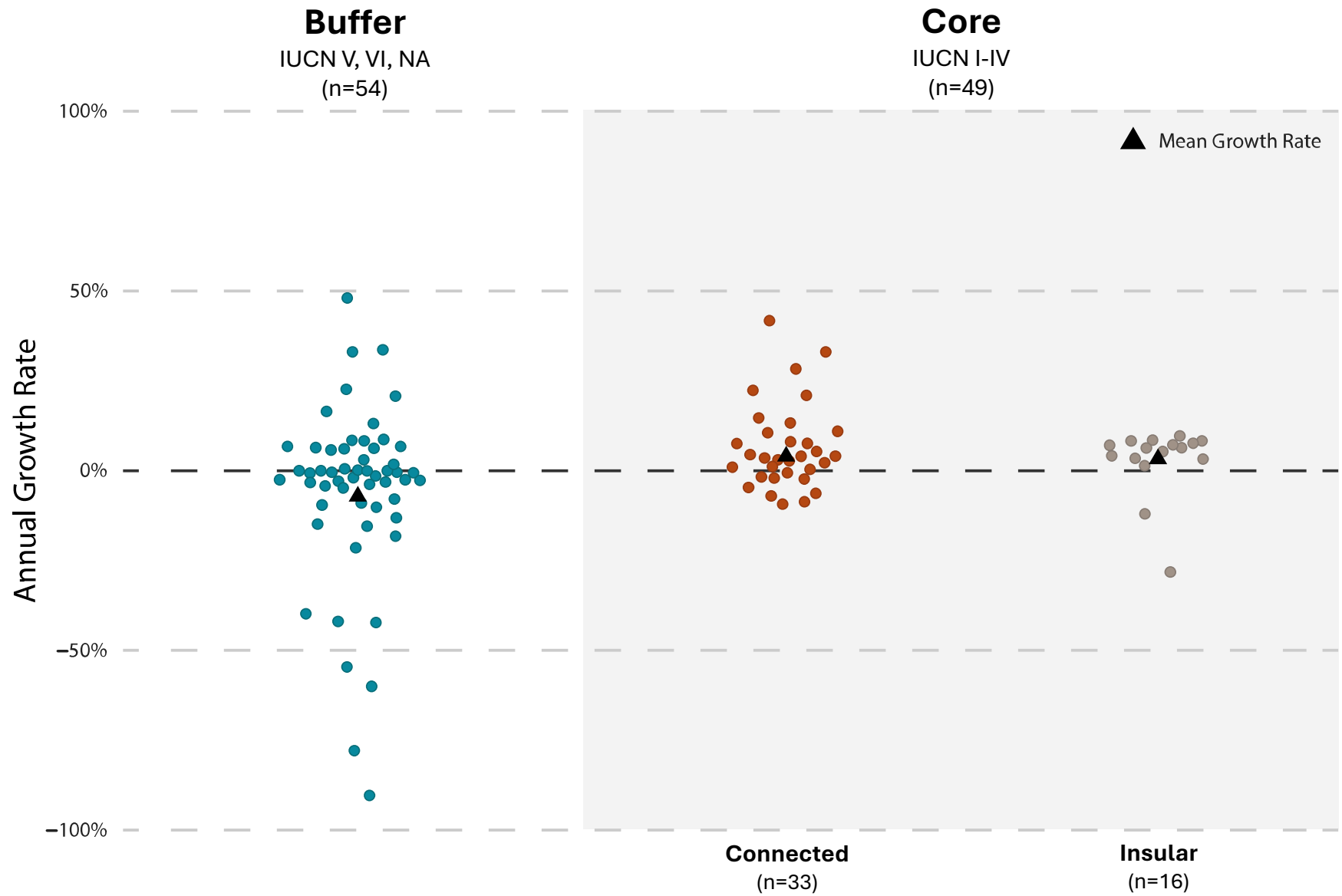




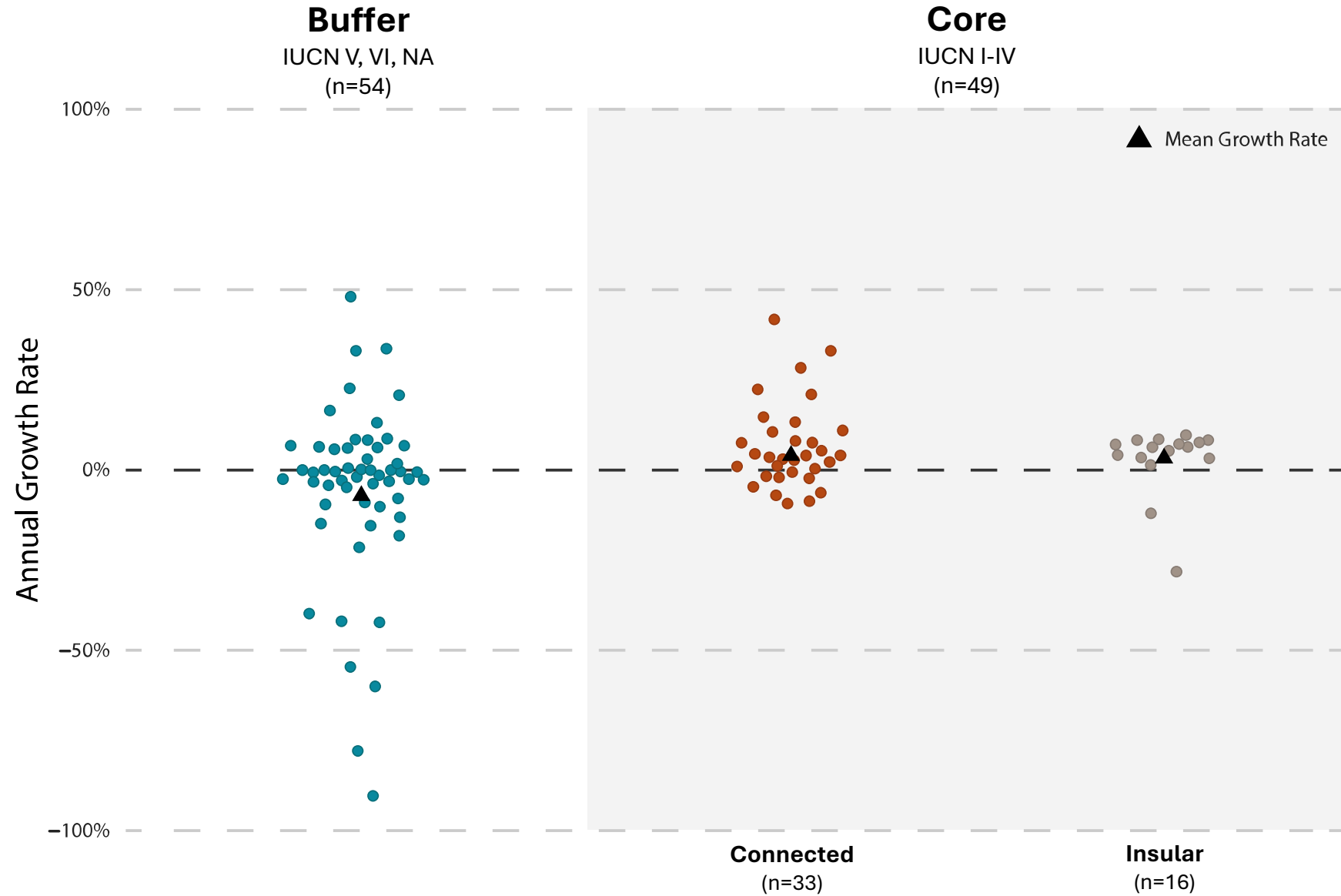
# Stronger protection increased population growth rates

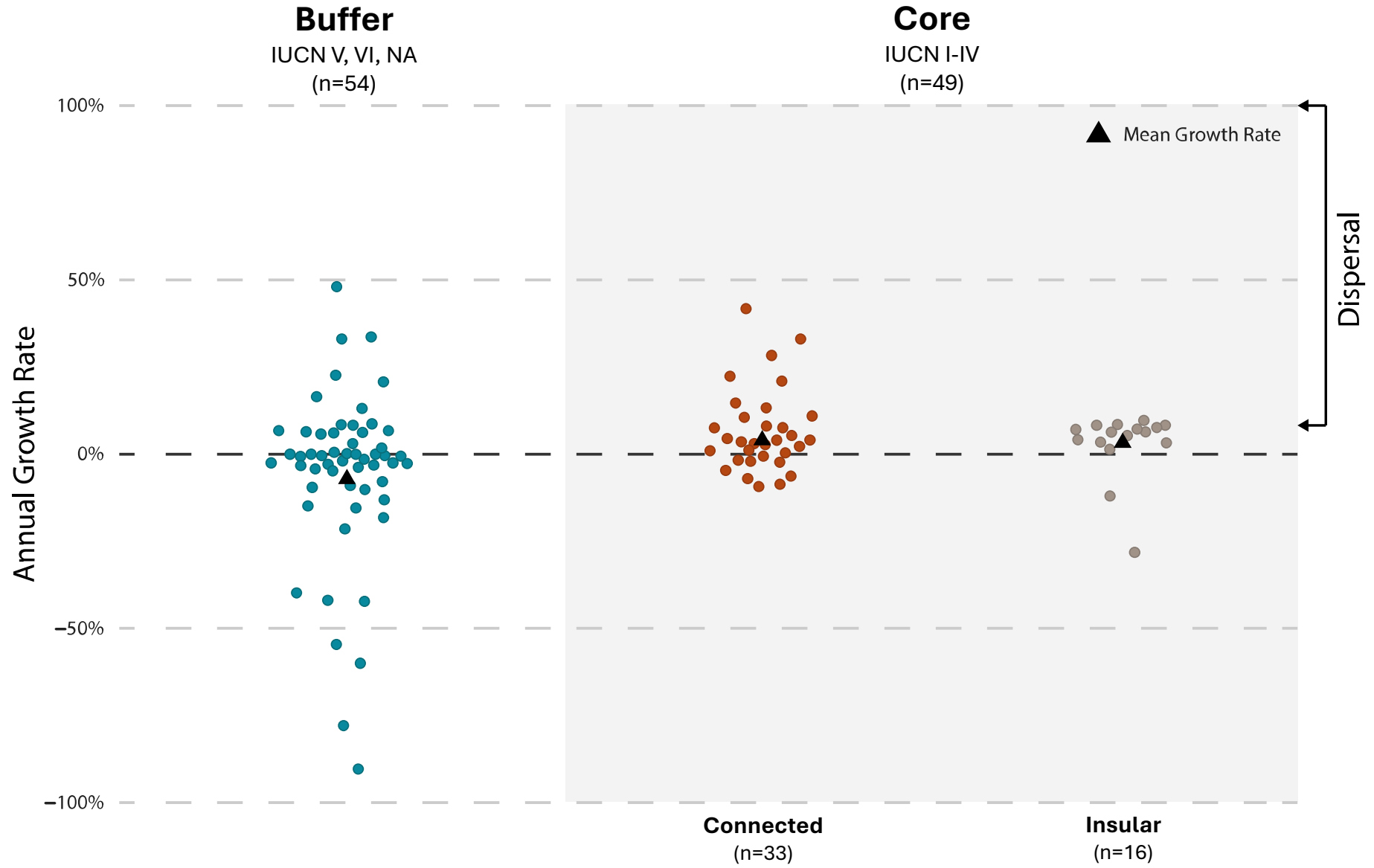




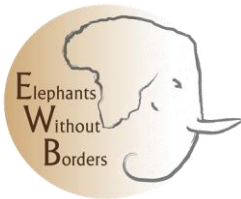
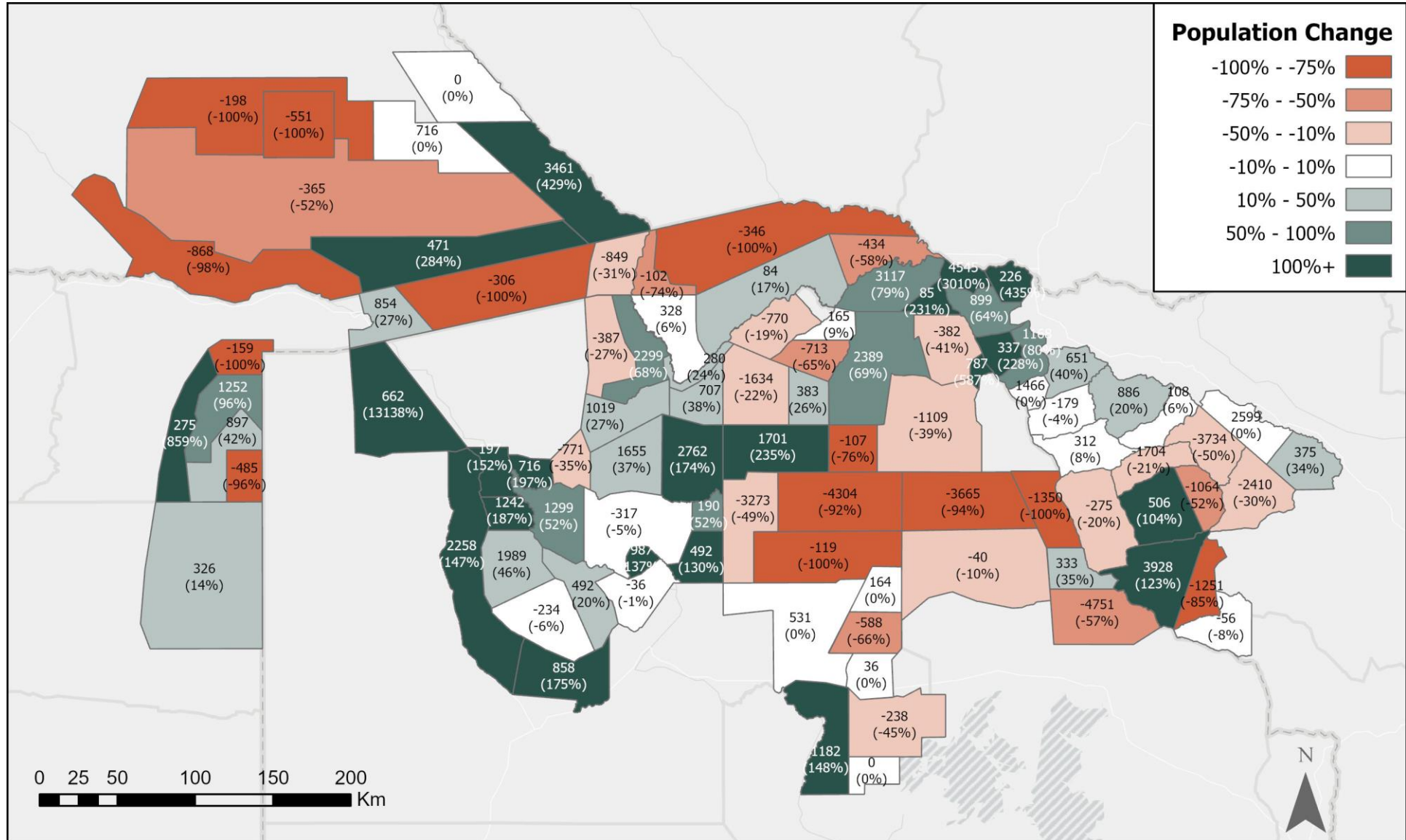


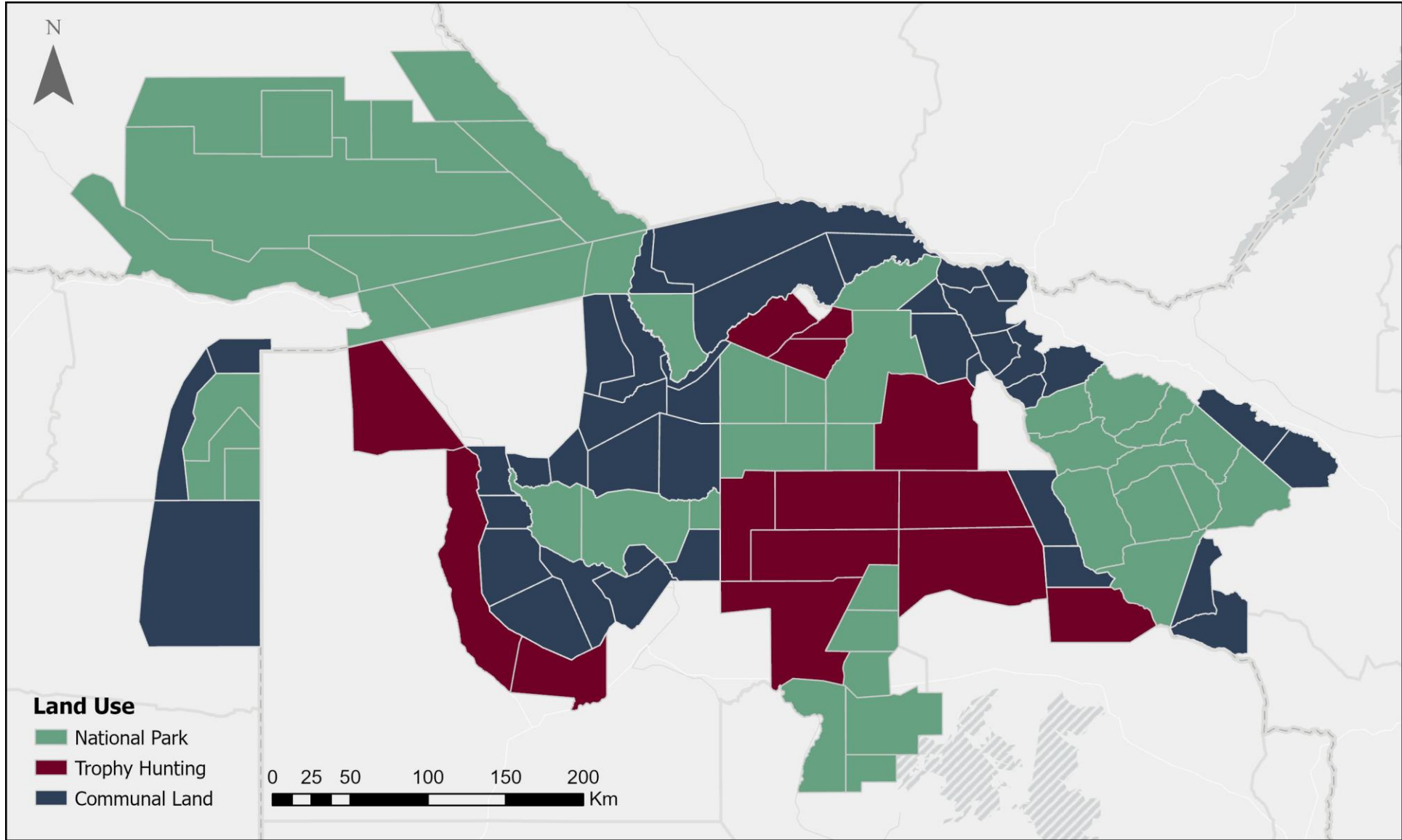
# Isolated populations cannot grow more than 6-8%



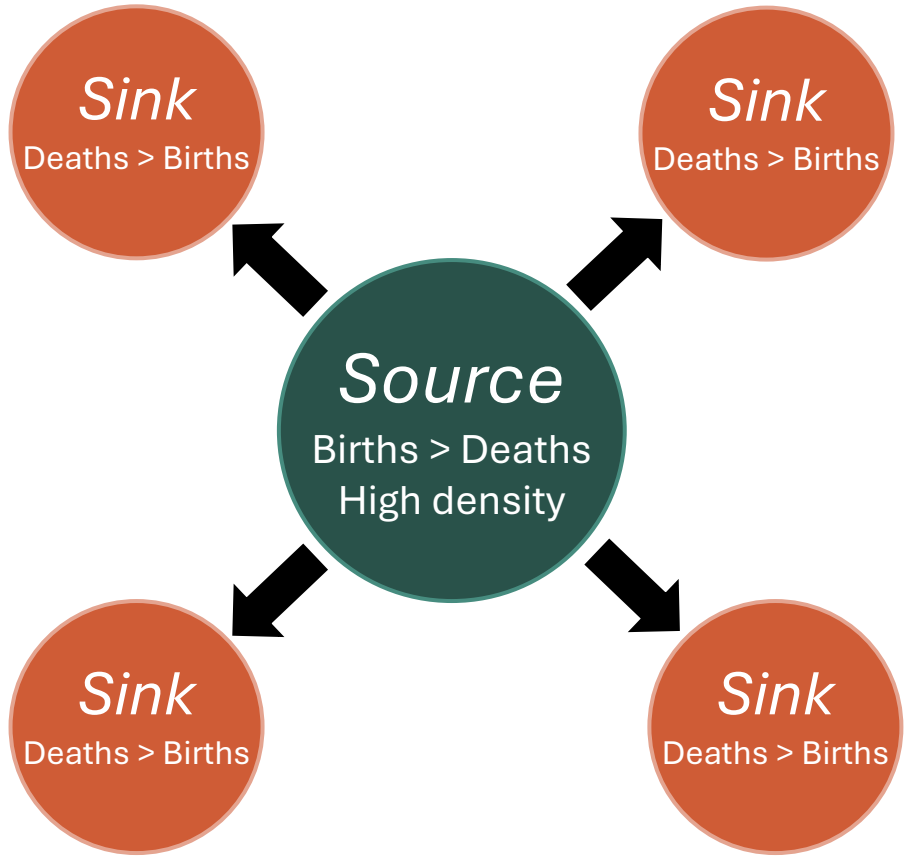


# KAZA Elephant population change between 2014 & 2022





# Metapopulation Theory



Move towards low densities

**VS**

# Landscape of Fear



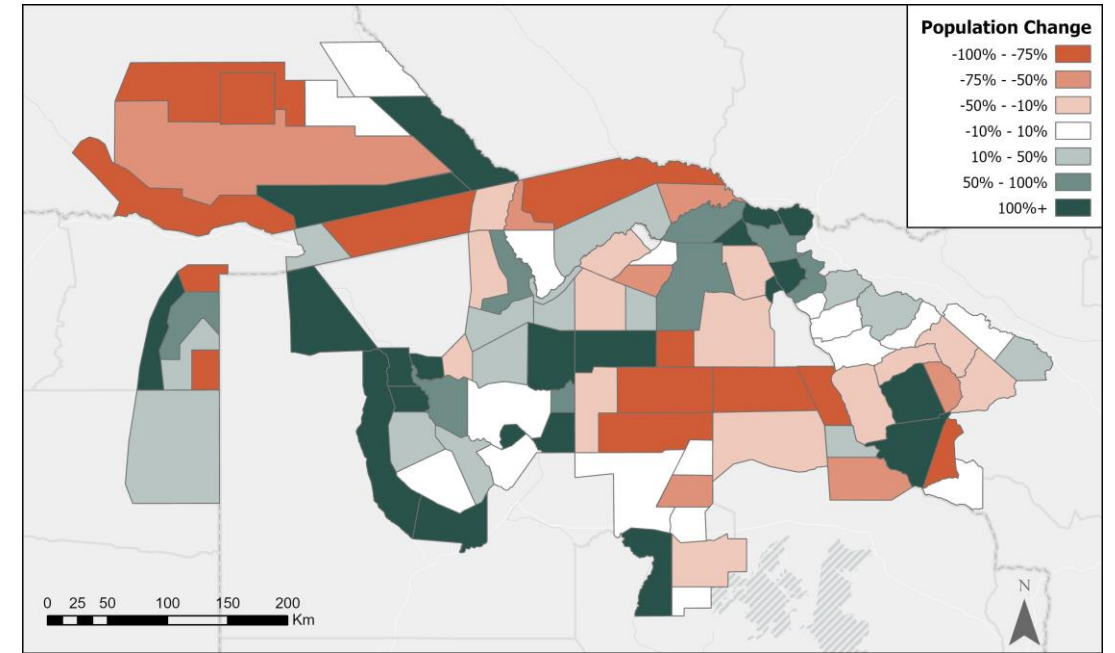
Move towards safety

# Assumptions

## 1: *Closed Population*

Net migration = 0

Intraregional movement > Extraregional movement



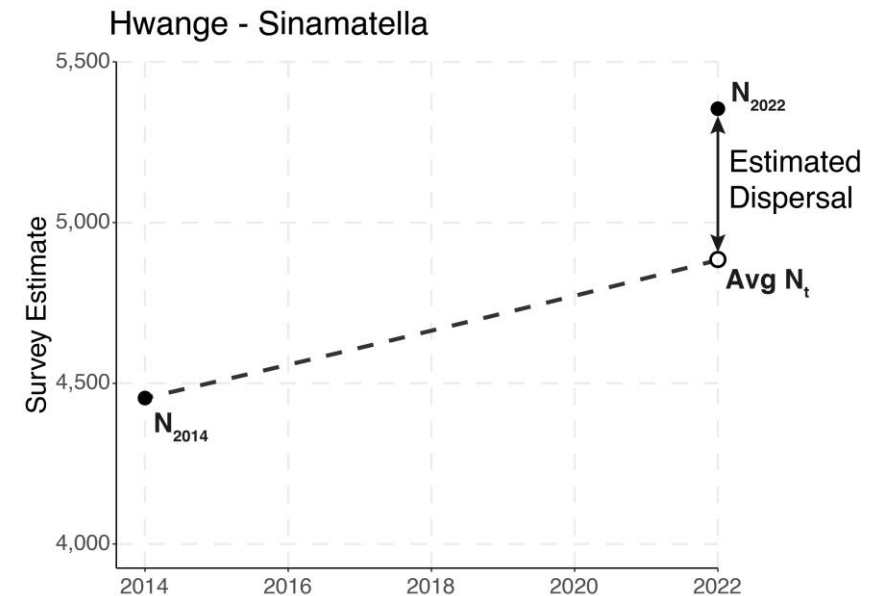
## 2: *Homogeneous birth & death rates*

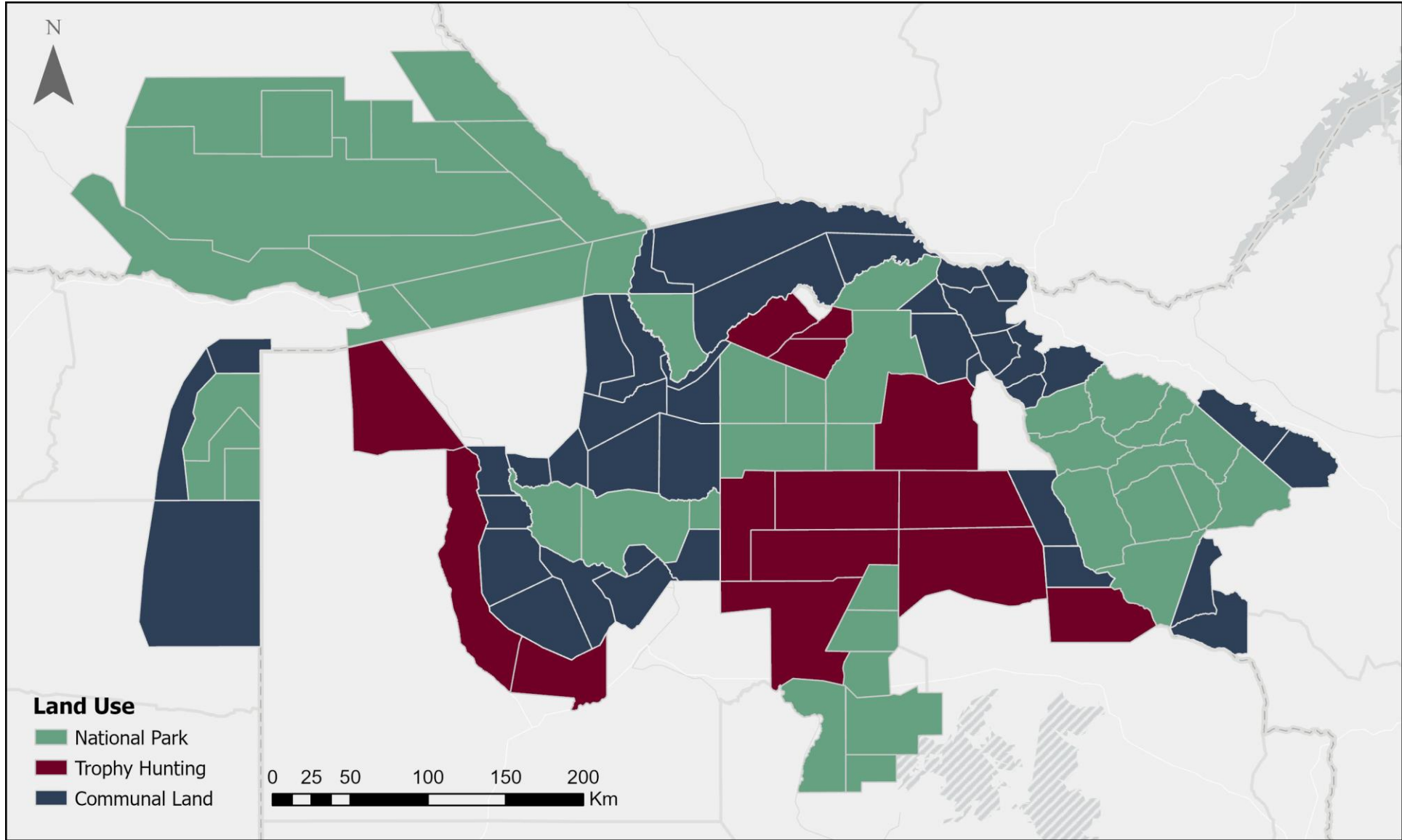
$$N_{2014} = 181,059$$

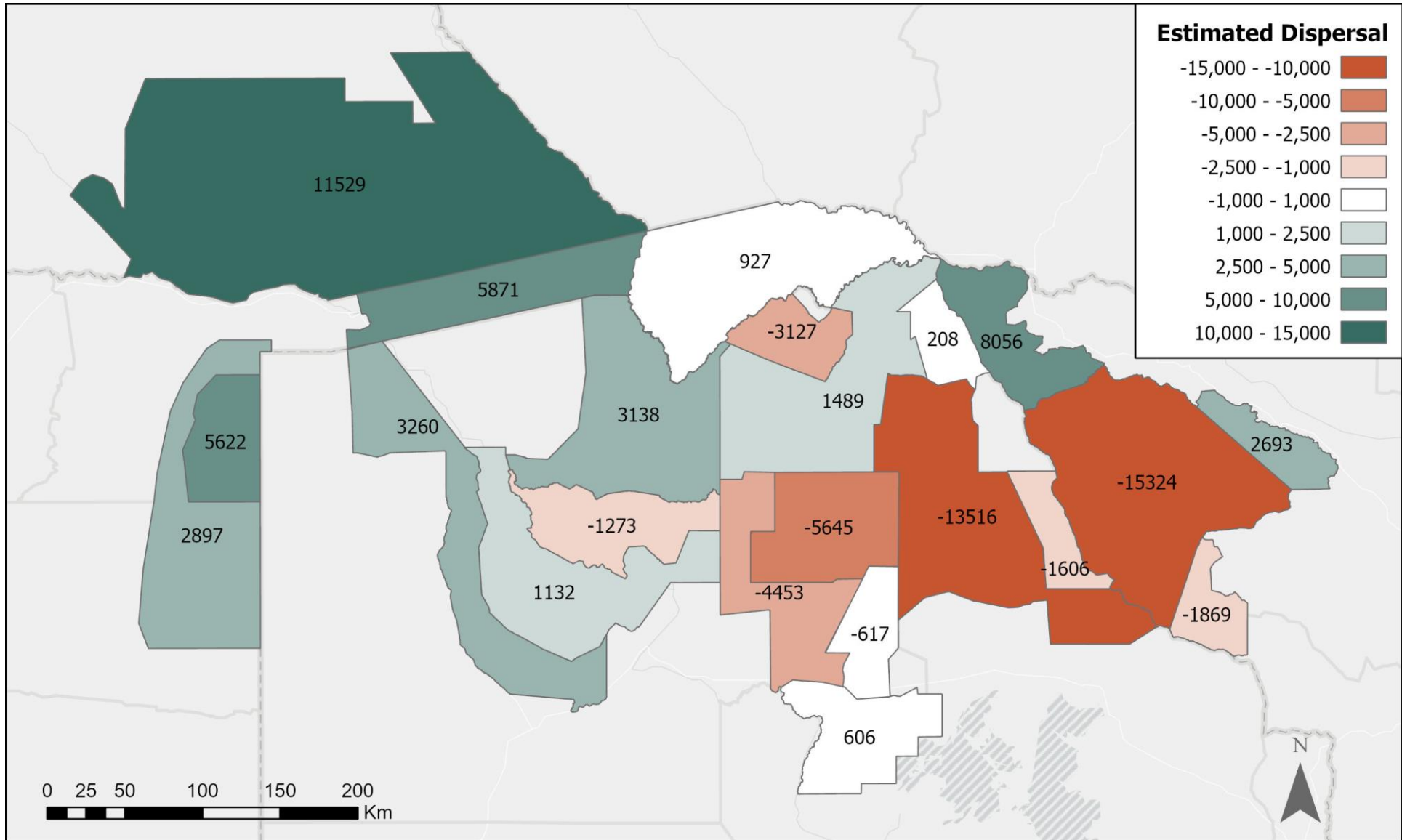


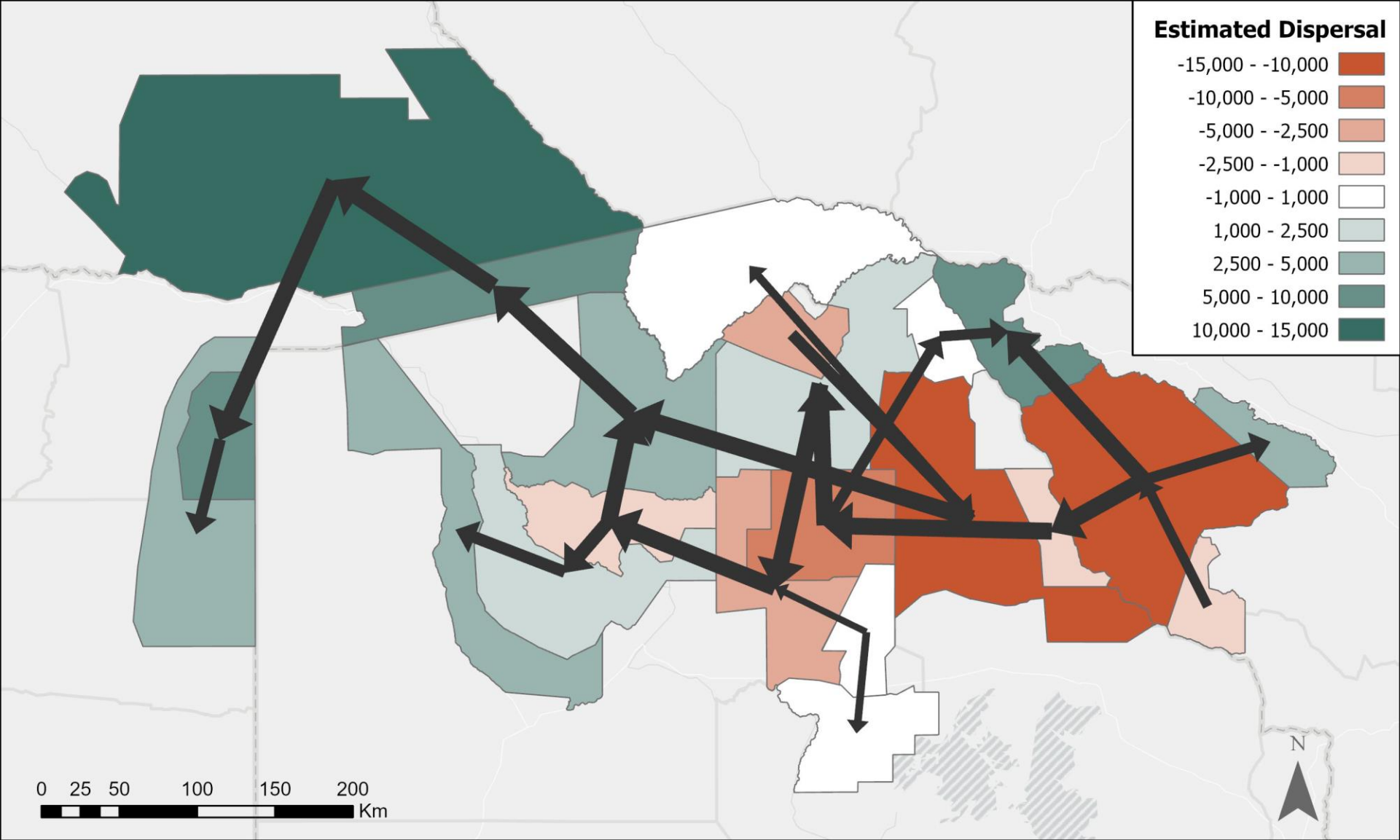
$$r = 0.0115$$

$$N_{2022} = 198,583$$

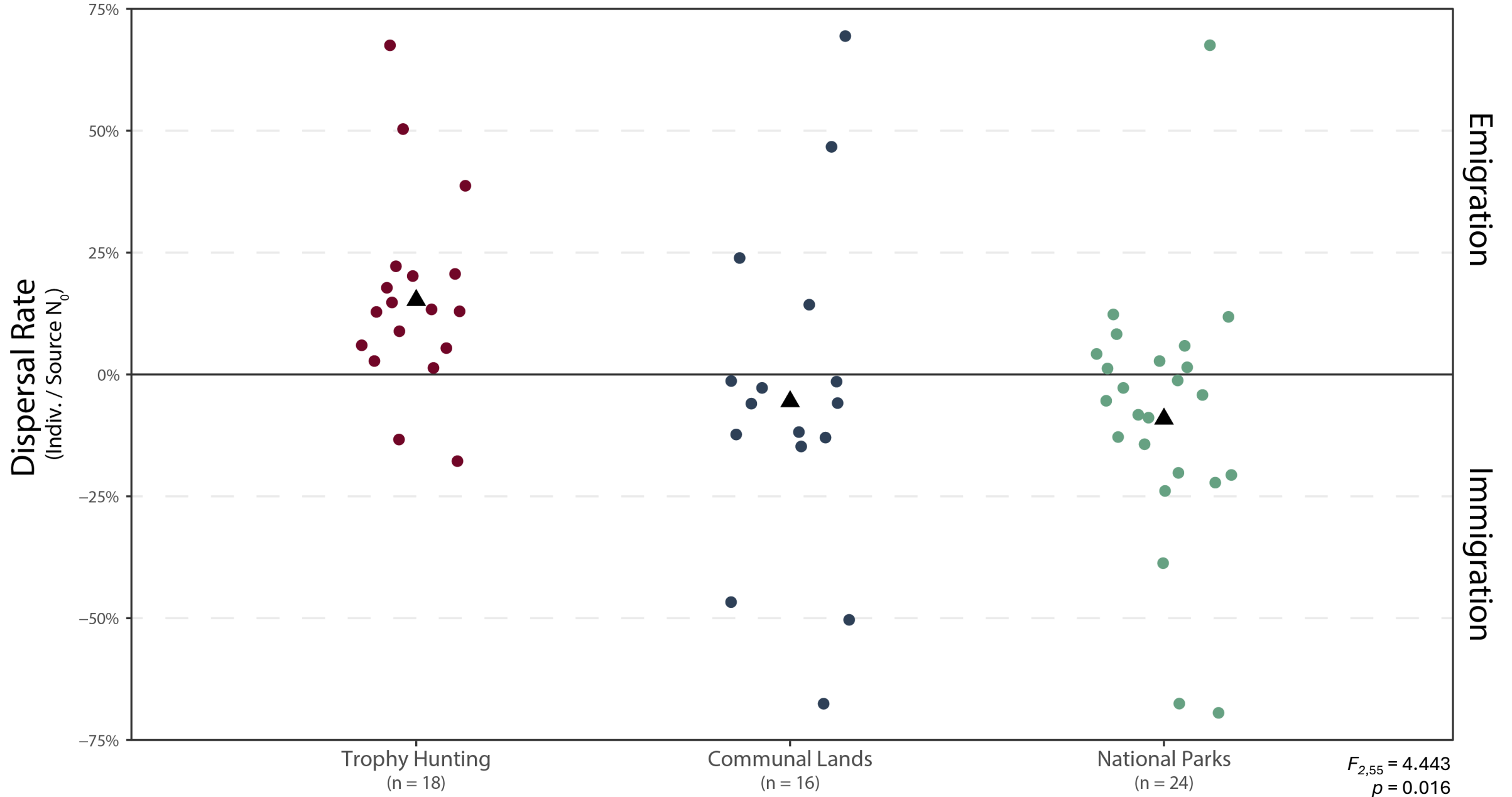




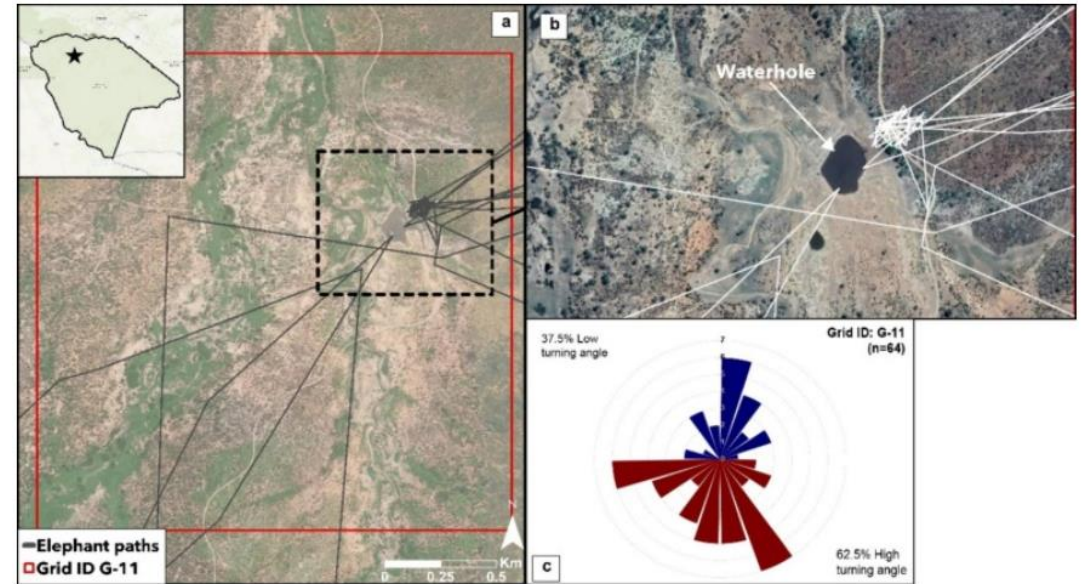
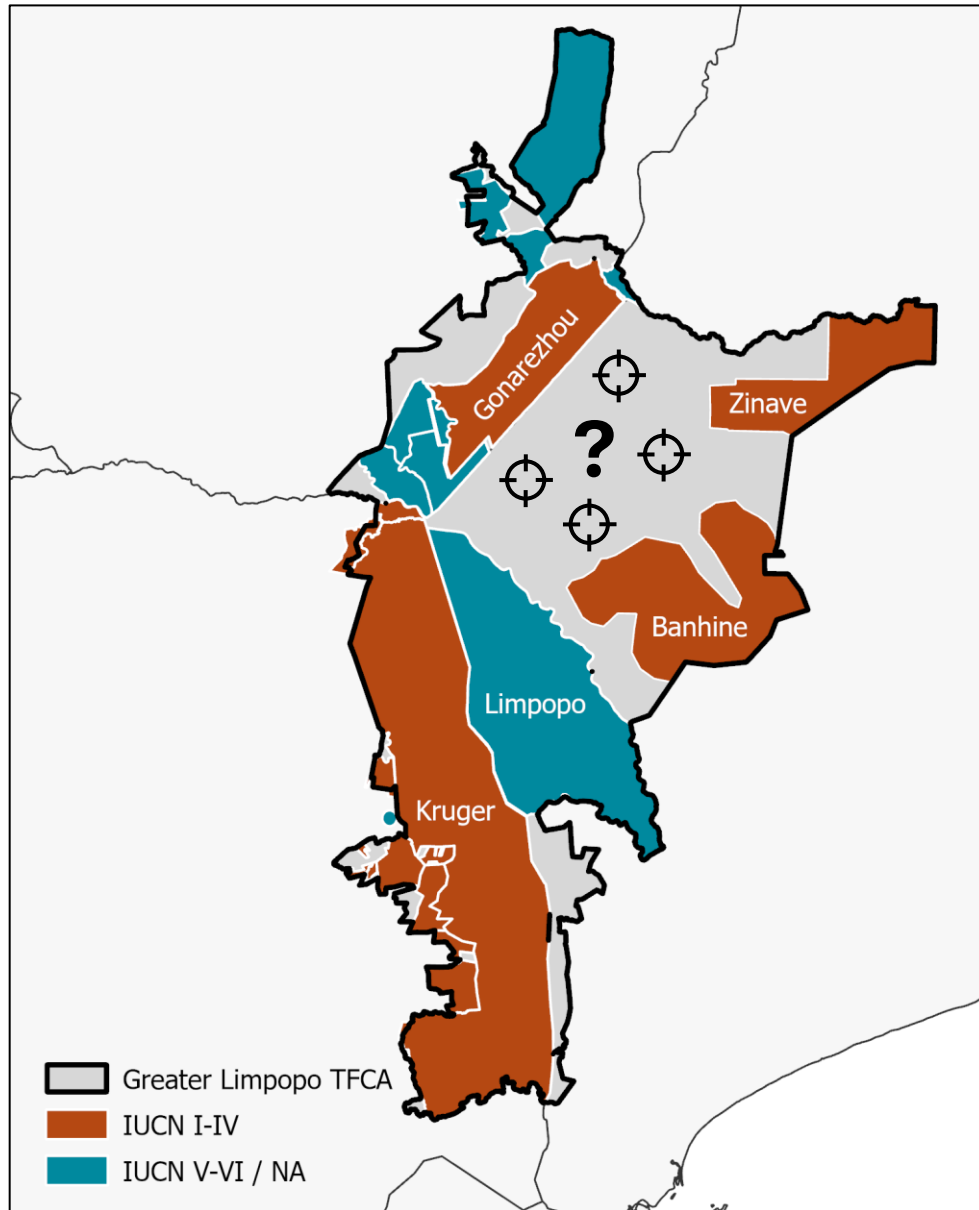




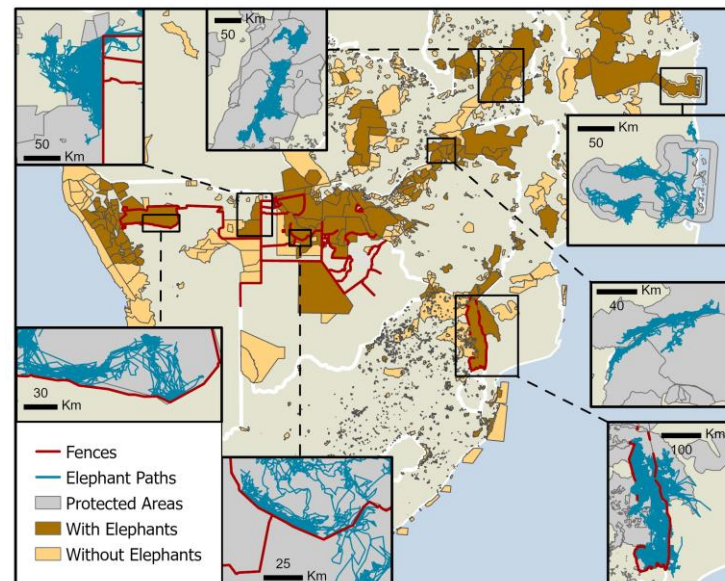
# Elephants move from hunting concessions towards protected areas



# How we design landscapes controls elephant movement & population growth



Bucciarelli et al. (2024) *Biological Conservation*



Huang et al. (2022) *PLOS One*

# RESEARCH TEAM



**Questions?**



## Next Steps

- Refine optimization model based on distance and area
- Vary growth rates across strata
- Include fences as a barrier to dispersal
- Monte Carlo simulations to account for survey error