Using detailed human mobility and remote sensing data to assess wildlife responses to altered human behavior

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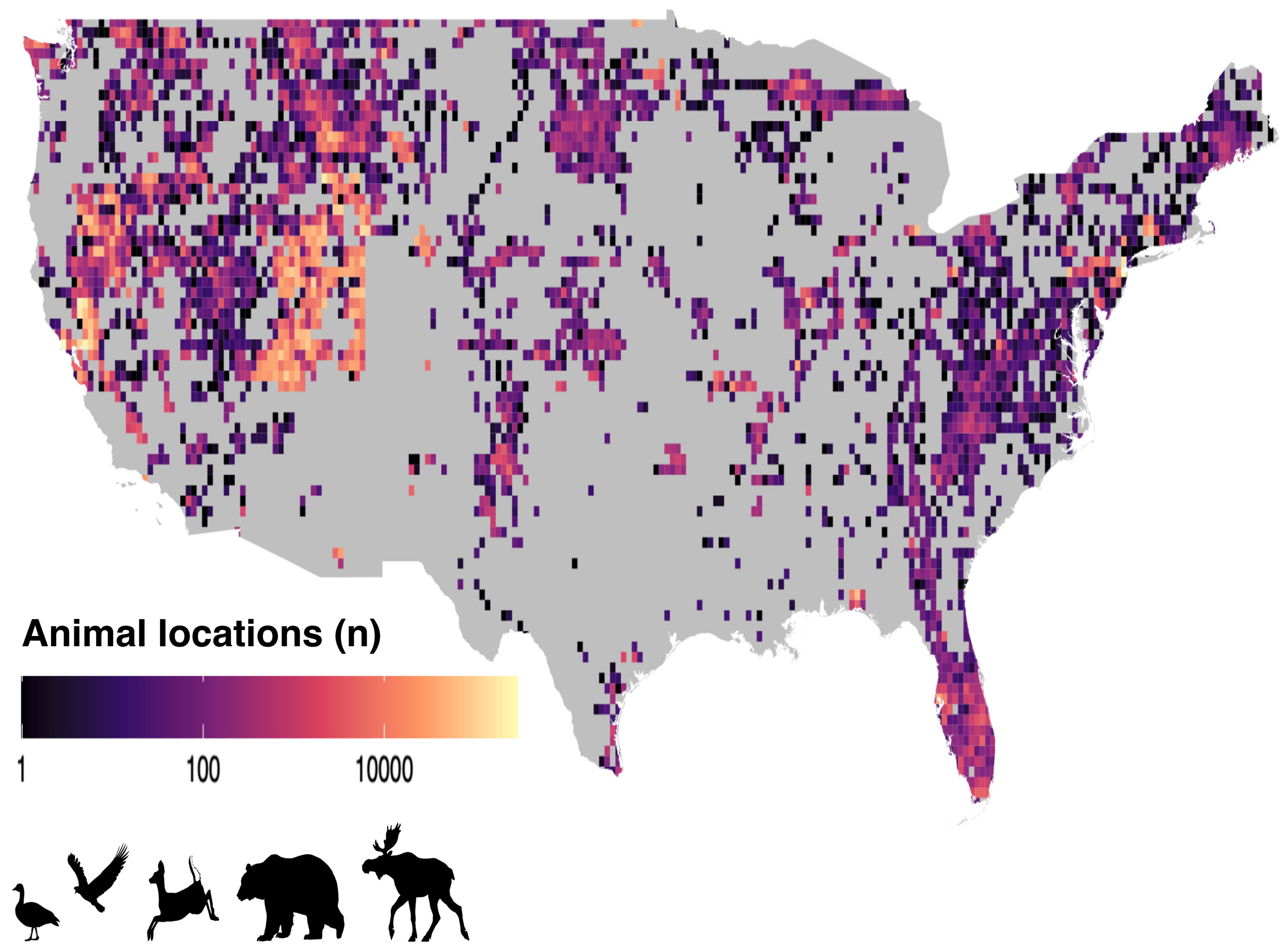


INTRODUCTION

During 2020, many countries worldwide went into lockdown to control the spread of COVID-19. While brought under the most unfortunate of circumstances, this period of unprecedented reduced human mobility, - coined the anthropause - can provide unique insights into human-wildlife interactions [1]

We quantify how terrestrial birds and mammals altered their (I) space use across the USA in response to human infrastructure and mobility during 2019-2020.

We (II) introduce the concept of an anthropause repository to lay future foundations for human-wildlife studies during current and future anthropauses

MATERIALS & METHODS

Animal movement data:
Data mobilization by the COVID-19 Biologging Initiative
~12 million GPS locations, 4000+ individuals
across terrestrial birds & mammals

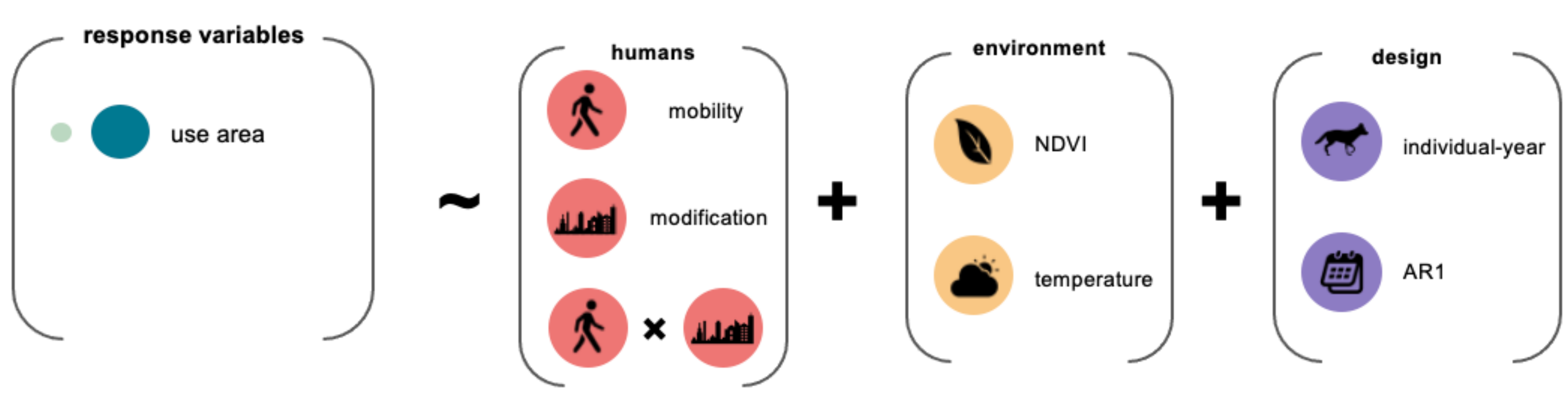
Human mobility (Dynamic, SafeGraph) [2]
& infrastructure (Static, Human Modification Layer)

Environmental variables: NDVI (MODIS),
Temperature (DayMet), Precipitation (CHIRPS)

Analysis:
Weekly dynamic Brownian bridge movement model [3]

Model space use responses as a function of anthropogenic and environmental predictors

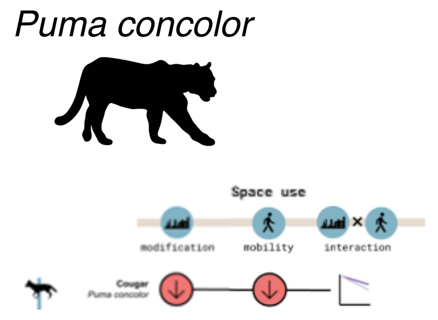
CHARACTERIZING WILDLIFE RESPONSES



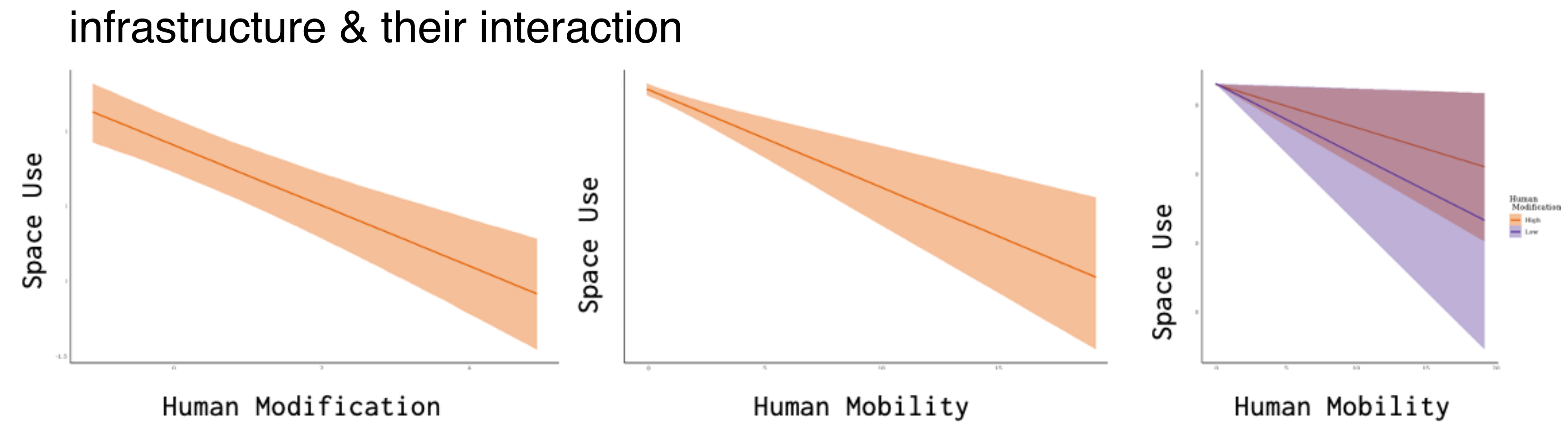
RESULTS

CASE STUDY: COUGAR

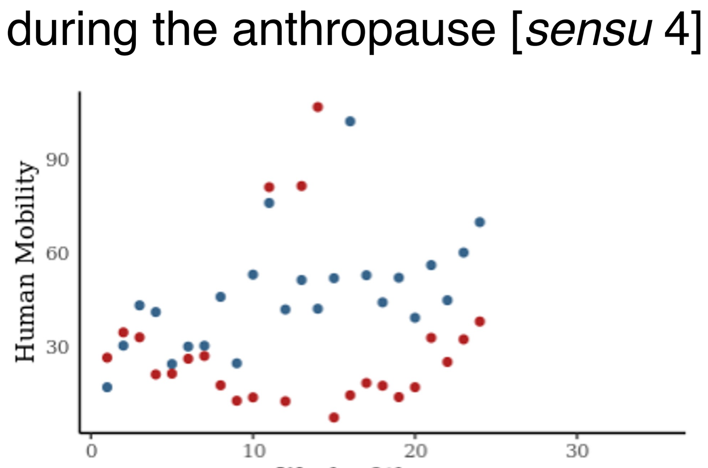
Puma concolor

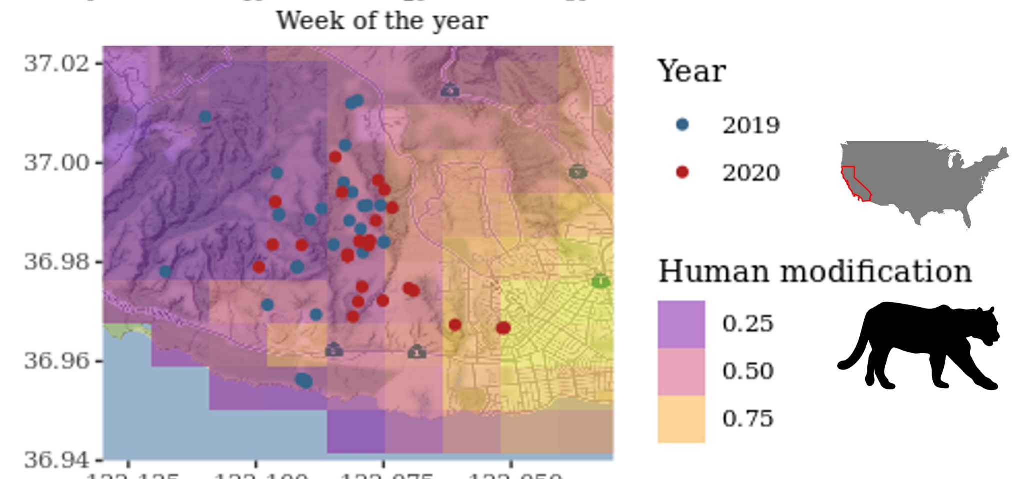


Cougar space use declined with increasing human mobility, infrastructure & their interaction



Moved closer to settlements during the anthropause [*sensu* 4]

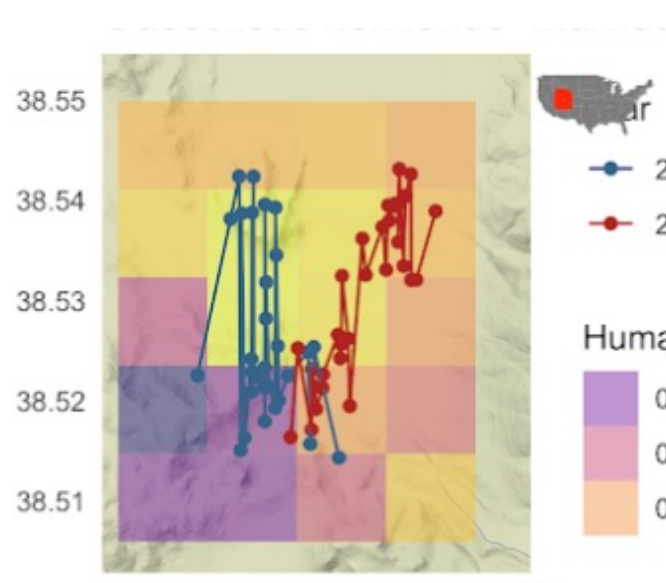




Data from Chris Wilmers

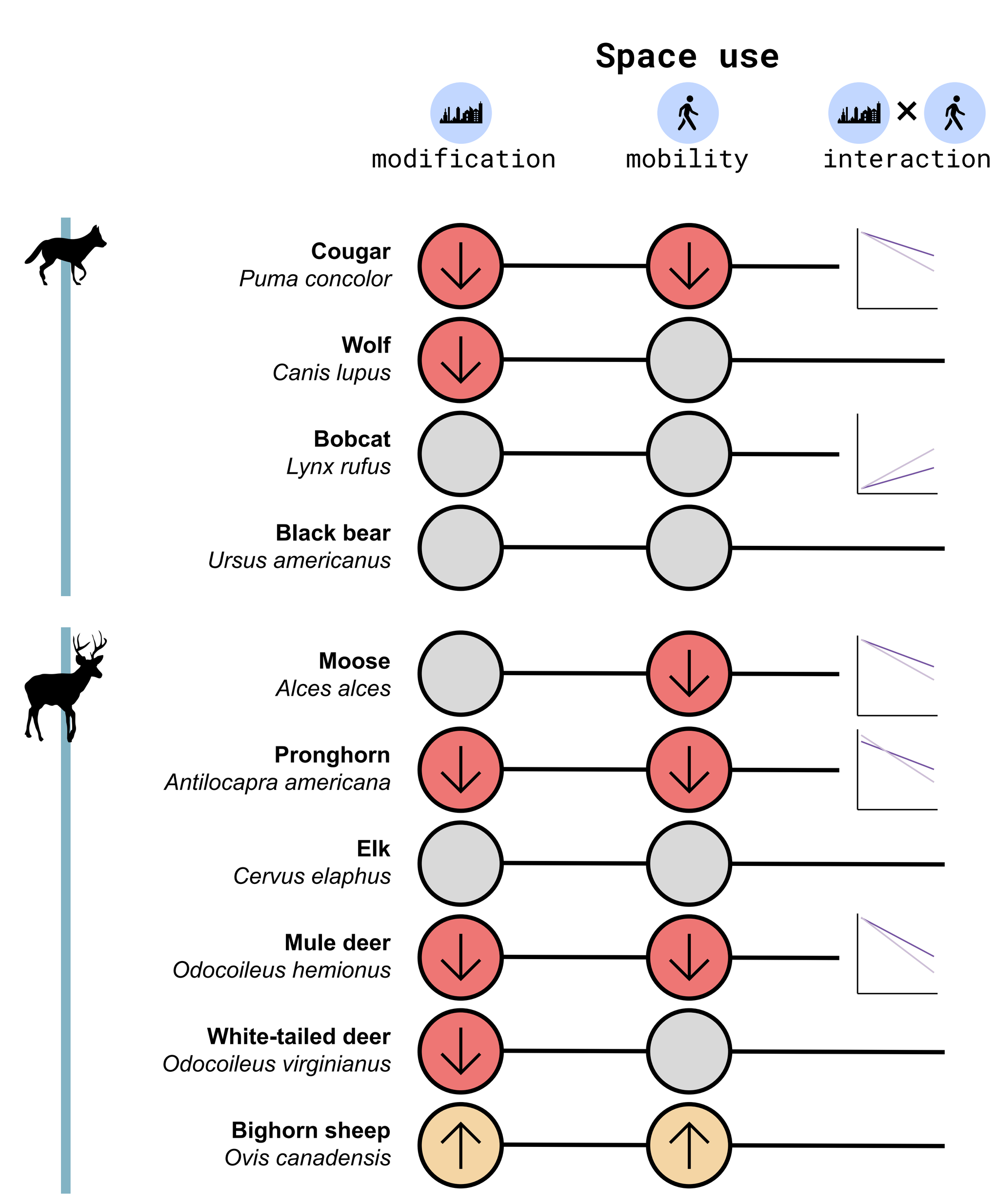
CASE STUDY: MULE DEER

Mixed responses



Data from Tal Avgar

ANTHROPAUSE TYPOLOGY



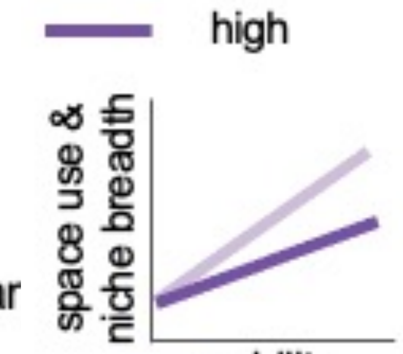
LEGEND

relationship

- negative
- positive
- non-significar

modification

- low
- high



ANTHROPAUSE READINESS & NEXT STEPS

HANIMOB

The 2nd ACM SIGSPATIAL International Workshop on Animal Movement Ecology and Human Mobility

Seattle, Washington, USA - 1 November 2022

We plan to make studies discoverable, and if data owners wish, downloadable, to ensure future use of this unique dataset to facilitate future studies and increase our anthropause readiness [5]

Efforts will mirror NASA supported animal movement arctic archive [6] with the motivation of creating a living repository

We are supporting other global COVID-19 Biologging Initiative with conceptual, methodological and remote sensing support

I am co-organizing a working group on bringing human geographers and movement ecologists together to dynamically study human wildlife interactions

Started writing of manuscripts with co-authors Oliver & Yanco [7, 8]: COVID-19 pandemic reveals generality and idiosyncrasy in wildlife responses to human activity', 'Towards a dynamic-human footprint for assessing human-wildlife interactions"

Niche breath calculations will build upon developed methodology

Multispecies trait models to follow

CONCLUSION

Idiosyncratic responses of terrestrial mammals to static infrastructure and dynamic human mobility

Wildlife responds differently to the build environment and the movement of humans

Anthropause typology may reveal general drivers across species life histories, diet breath, etc.

Developed cyberinfrastructure and scalable methodology paves the wave for large scale comparative movement ecology

Sources

[1] Rutz et al., 2020 *NEE*
[2] Safegraph 2020
[3] Kranstauber *et al.*, 2012 *J. Animal Eco*
[4] Wilmers *et al., 2020 Curr. Biology*
[5] Rutz 2020 Nat. Rev. Earth. & Env.
[6] Davidson et al. 2020 Science
[7] Ellis-Soto, Oliver et al. in prep
[8] Oliver, Yanco, Ellis-Soto et al, in prep

Acknowledgements

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