Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
NATIONAL BIODIVERSITY FUTURE CENTER
FONDAZIONE EDMUND MACH

Human infrastructure can alter the ecosystem services provided by a migratory ungulate

PA88

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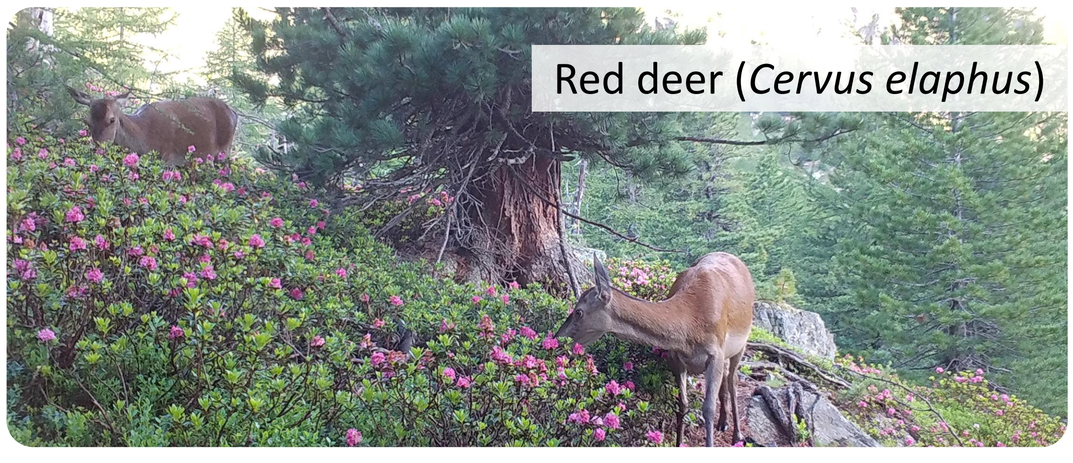
Introduction

- Wild ungulates, through their movement, provide **key ecosystem functions** → soil productivity, seed dispersal, and C sequestration
- **Loss of migratory routes** due to expanding human infrastructure networks and climate change can affect ecosystem functionality
- **Human activities** generally have a **negative impact** on the quality, quantity, and dynamics of soil nutrients, particularly N
- **Wild ungulates**, with their movement and space use, **can offset some of these impacts** by restoring nutrient concentrations, but also deplete them when local density is high, or connectivity is lacking

AIM: Map the **nitrogen (N)** flow derived by large migrating ungulates, and discuss **services/disservices** provided

2EcoChange project

- Reconcile the knowledge of **Ecological science** and **Economics** related to regional/local systems
- Provide a **resilience model** accounting for both biodiversity and socio-economic value of the Alpine space



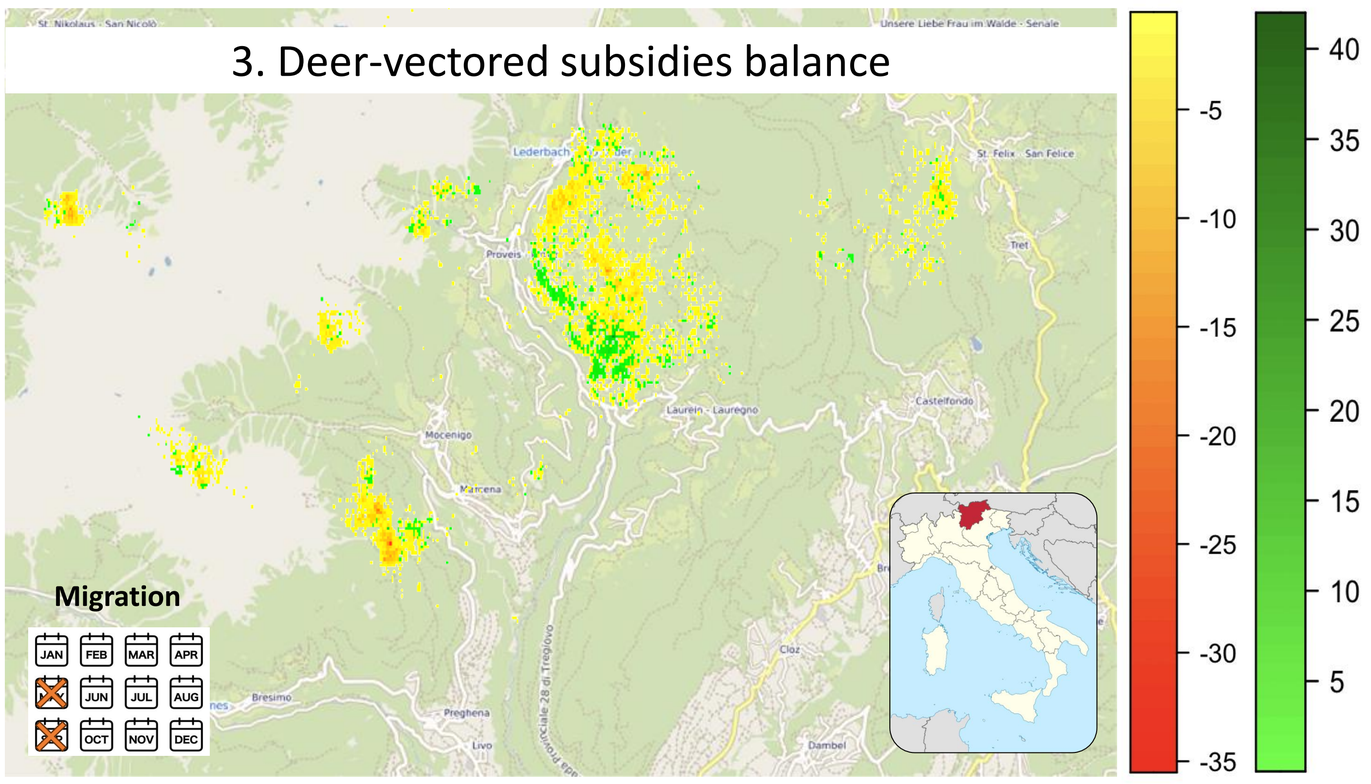
Material and Methods

ECOLOGICAL SETTING — *Agent-Based Modelling*

1. Layer **NDVI** (10m-cell matrix), proxy for vegetation

2. Agents **15** GPS-tracked **wild red deer** (2 years) **+**
60 simulated deer (4 per wild deer, 15 groups)

Daily defecation rate → 10-12 dungs per deer/day
Body mass (w/ loss) → 111 kg ♀, 177 kg ♂



Preliminary results

- **Stoichiometric map:** spatially-explicit understanding of nitrogen **consumed** and **deposited** by wild ungulates (*see Figure*)
- **Migration** of ungulates (movement between winter and summer ranges) affects nutrient concentrations
- **Human infrastructure** networks and land use **shape** red deer movement → hotspots of N intake and uptake

ECOSYSTEM SERVICES (IPBES guidelines)

- ☑ Regulation of environmental process
- ☑ Materials and assistance
- ☒ Non-materials

Discussion

- **Zoogeochemical processes** modulated by free-ranging animals and anthropogenic activities → infrastructure networks and barrier to movement of animals affect ecosystem functionality
- ***Next steps***: Quantitative analysis of the nutrient balance resulting from the **landscape of fear** generated by the naturally recolonizing wolf

Forum Nazionale della Biodiversità

Convegno Scientifico
20 21 maggio 2024
Università degli Studi di Palermo