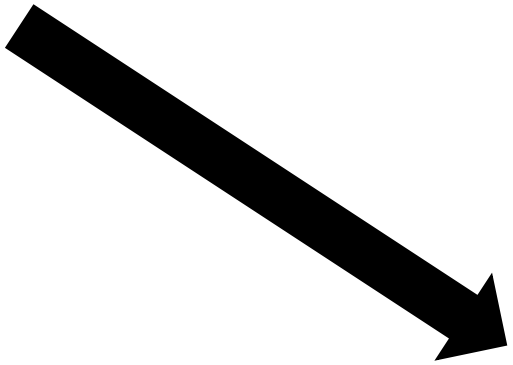
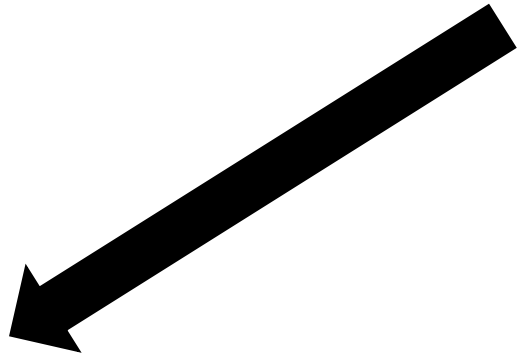
The relative importance of shelter on microclimate, plants, and animals in desert communities.

Ghazian Spring 2021 Progress Report

Background





Main Objectives

- Identify key sampling designs with camera traps.
- Record microclimatic impacts of eco-friendly materials and their influence on plant species under controlled conditions.
- Demonstrate ecological effects of shelters in the field.
- Compile frequency and ecological strength of microclimate facilitation reported in the literature.

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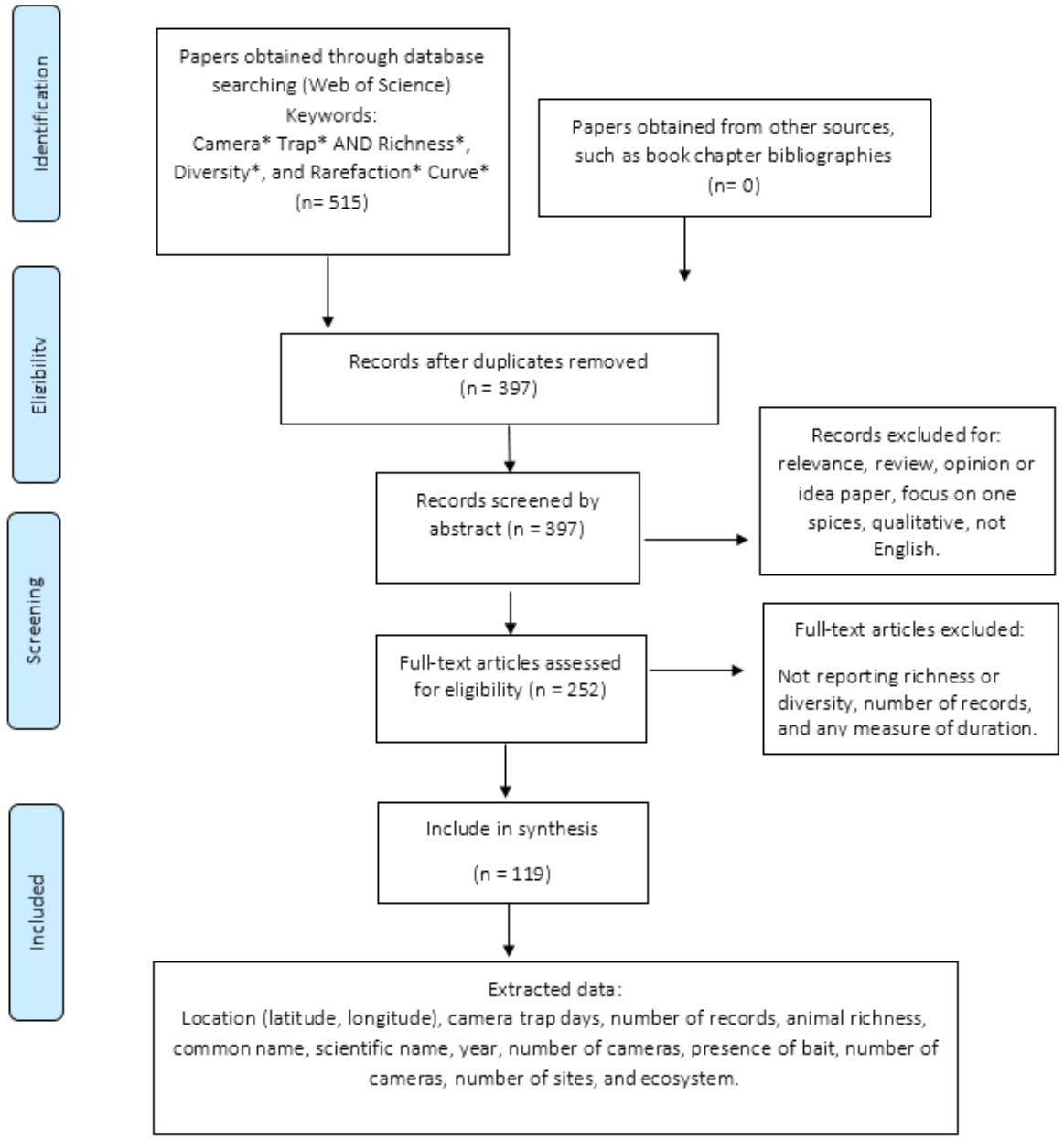
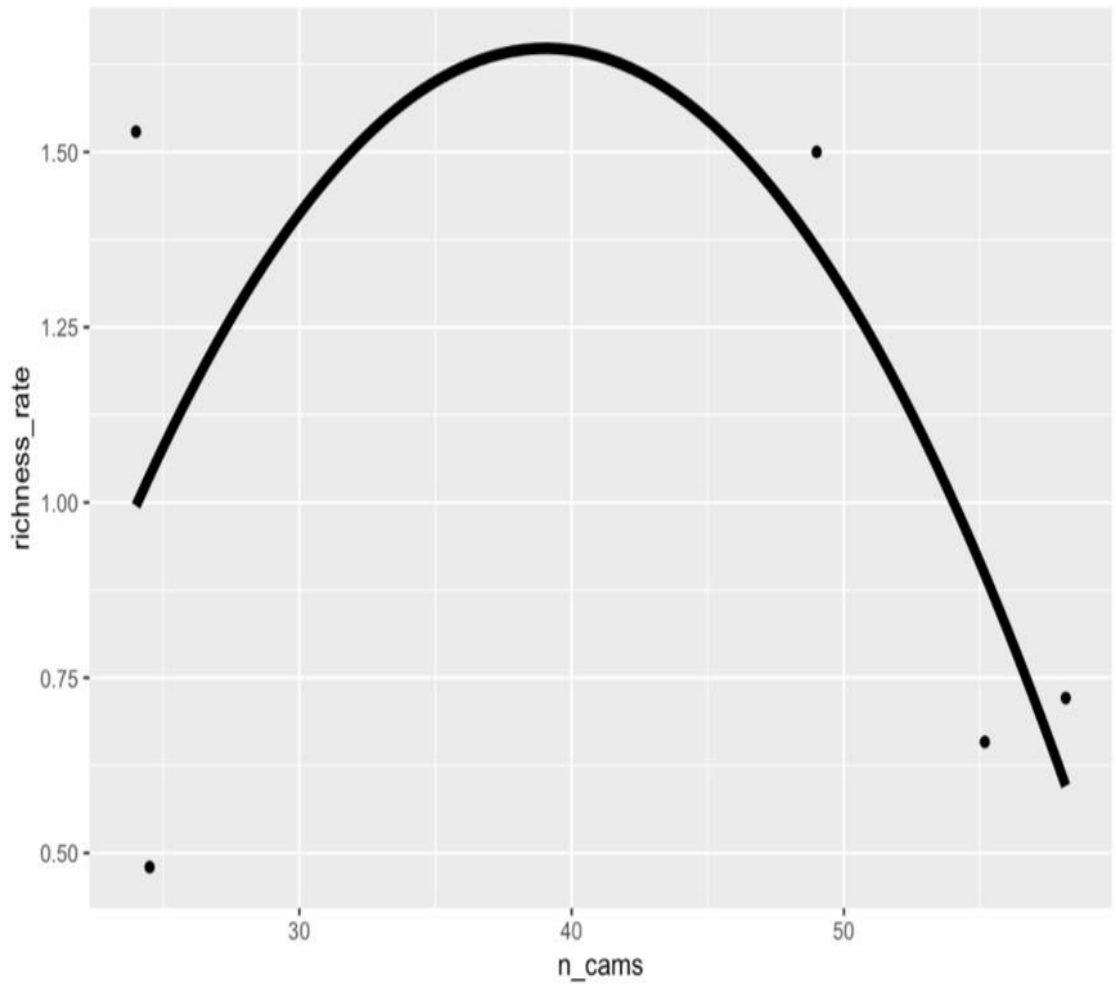
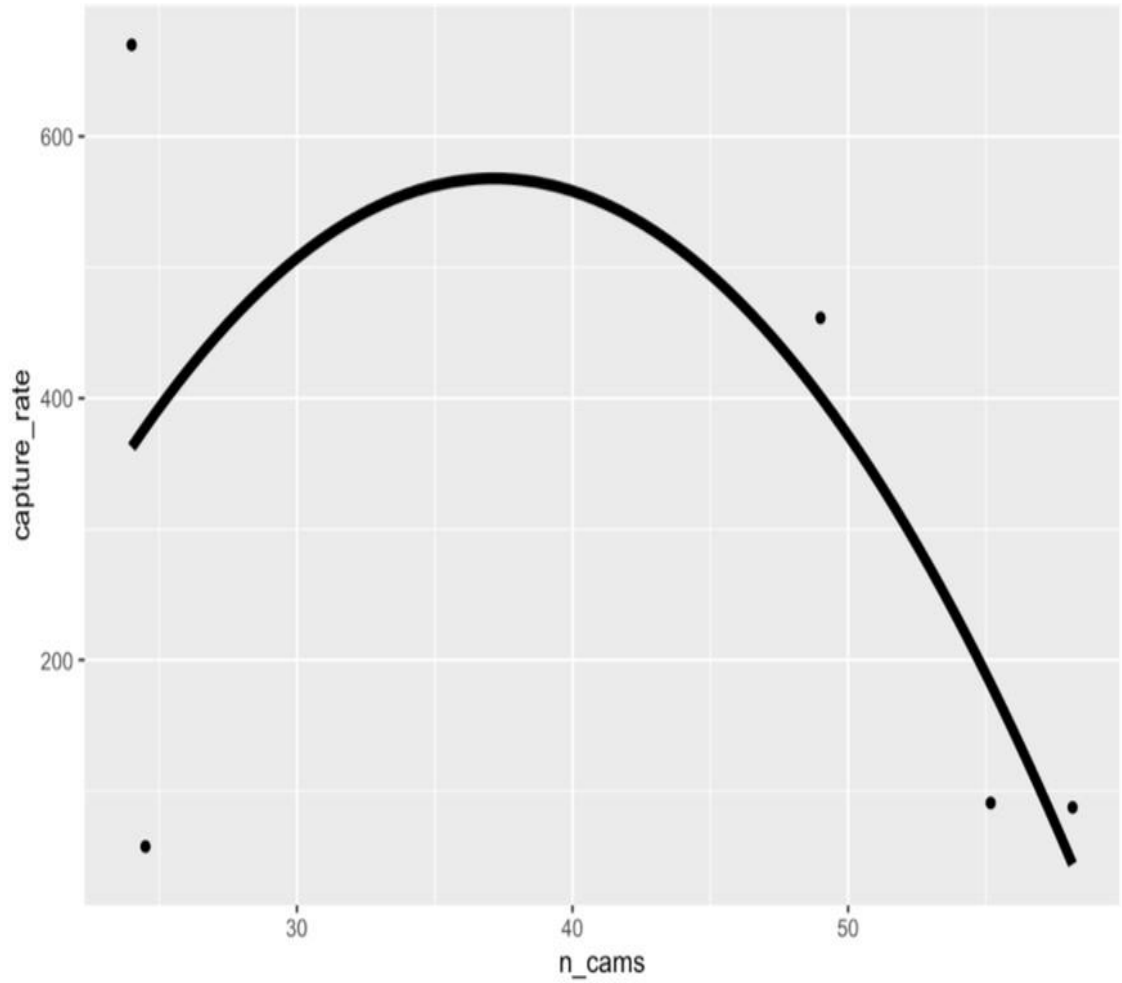
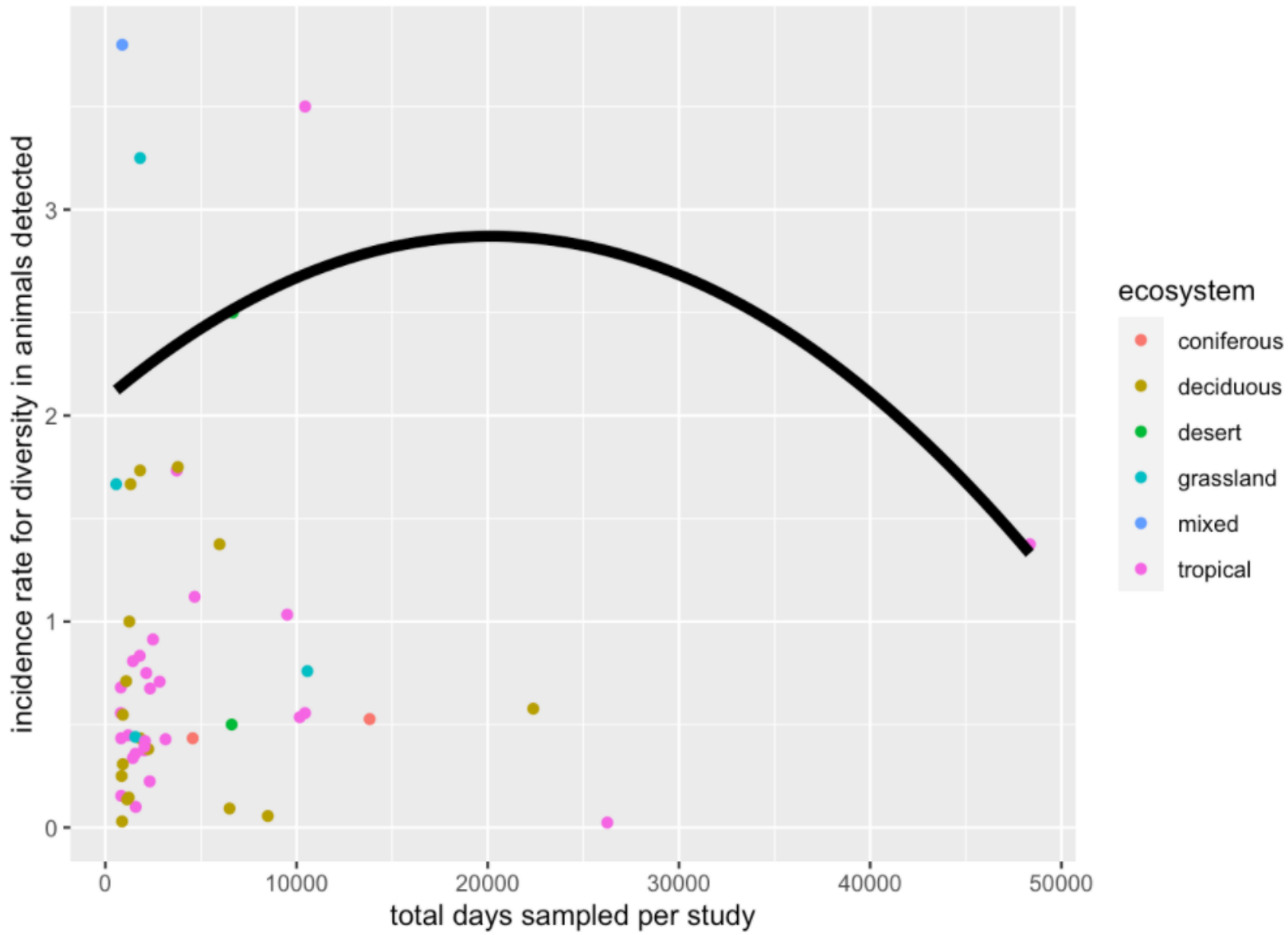
Chapter 1. Finding the sweet spot in camera trapping: a review of camera trap papers to test for reported sampling effort in population estimates.



A. PRISMA diagram used for camera trapping effort systematic review (Moher et al. 2009). Search done with keywords: Camera* Trap* AND Richness*, Diversity*, and Rarefaction* Curve* in 2019.


richness_rate
1.50
1.25
1.00
0.75
0.50
30
40
50
n_cams


capture_rate
600
400
200
30
40
50
n_cams


incidence rate for diversity in animals detected
0
1
2
3
0
10000
20000
30000
40000
50000
total days sampled per study
ecosystem
coniferous
deciduous
desert
grassland
mixed
tropical

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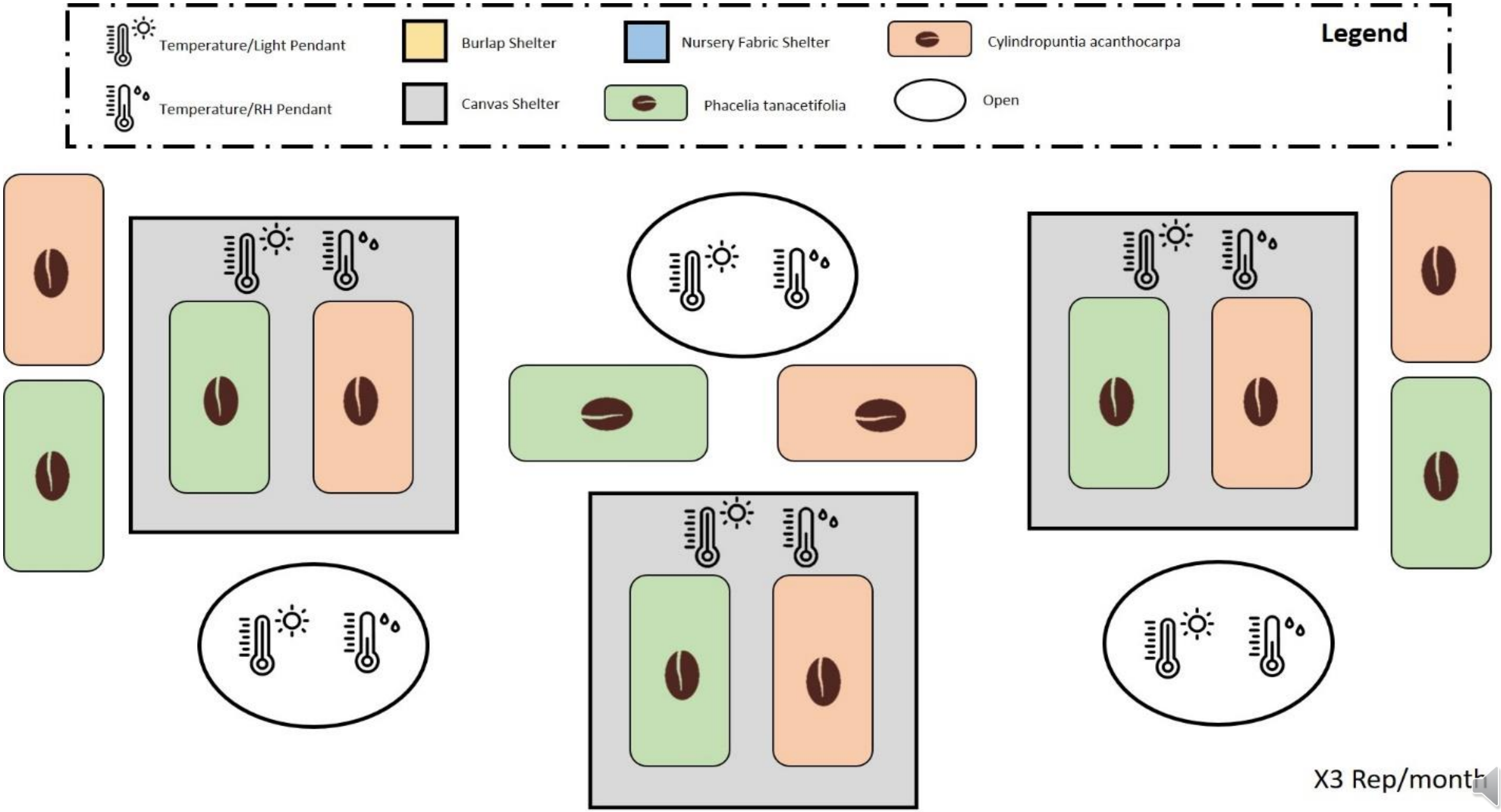
Chapter 2: Quantifying the extend of microclimatic amelioration of natural fabrics and estimating effects on native and exotic seedlings.

Purpose: To quantify the extent to which different natural fabrics facilitate the understory annual plant growth in comparison to the open gap.

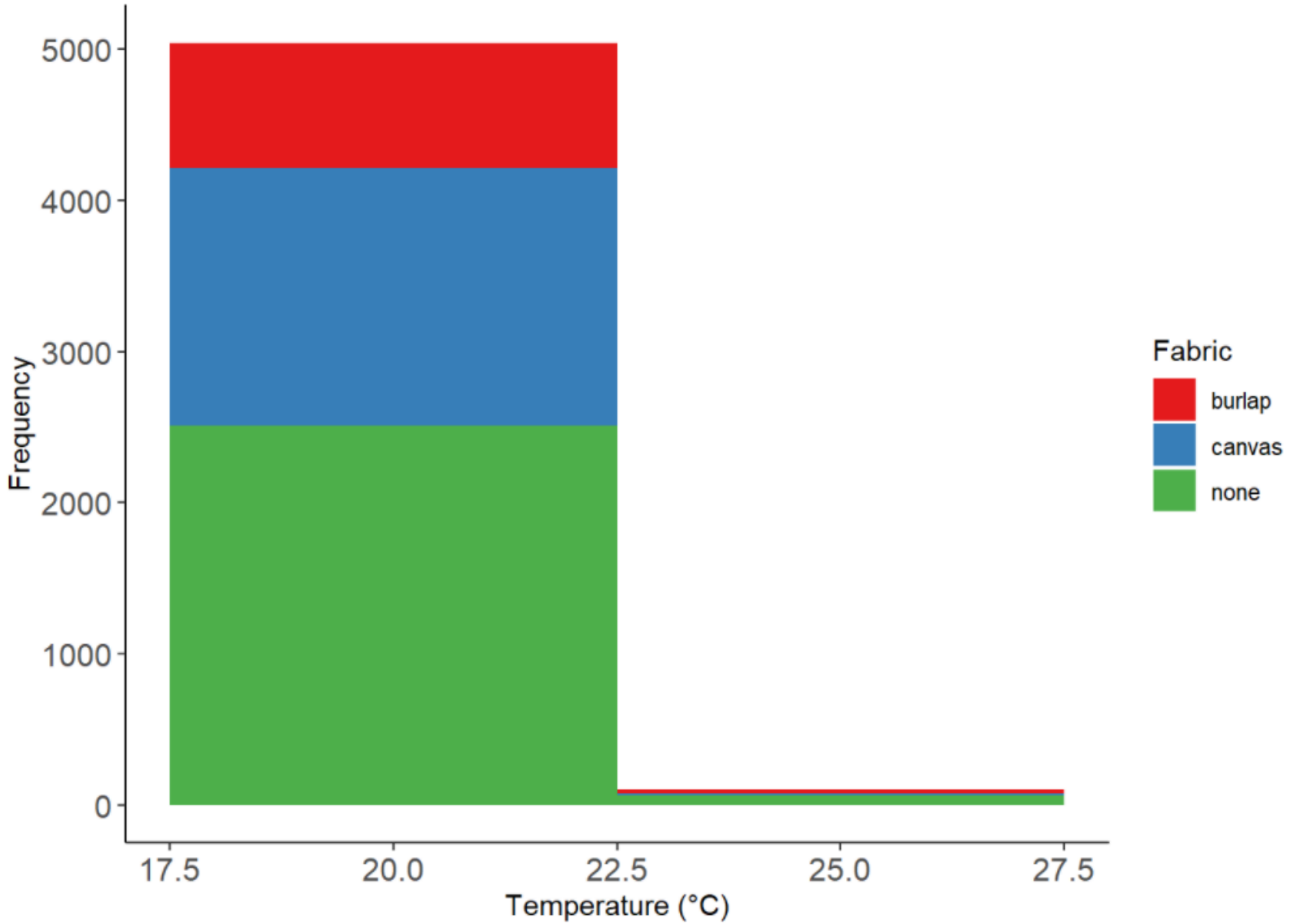
Questions: How do different natural fabrics such as burlap, cotton, and nursery seedling cloth affect microclimatic parameters such as RH, temperature, and light? How do different fabrics affect understory annual growth? Are annuals and foundation plants facilitated to the same extend?

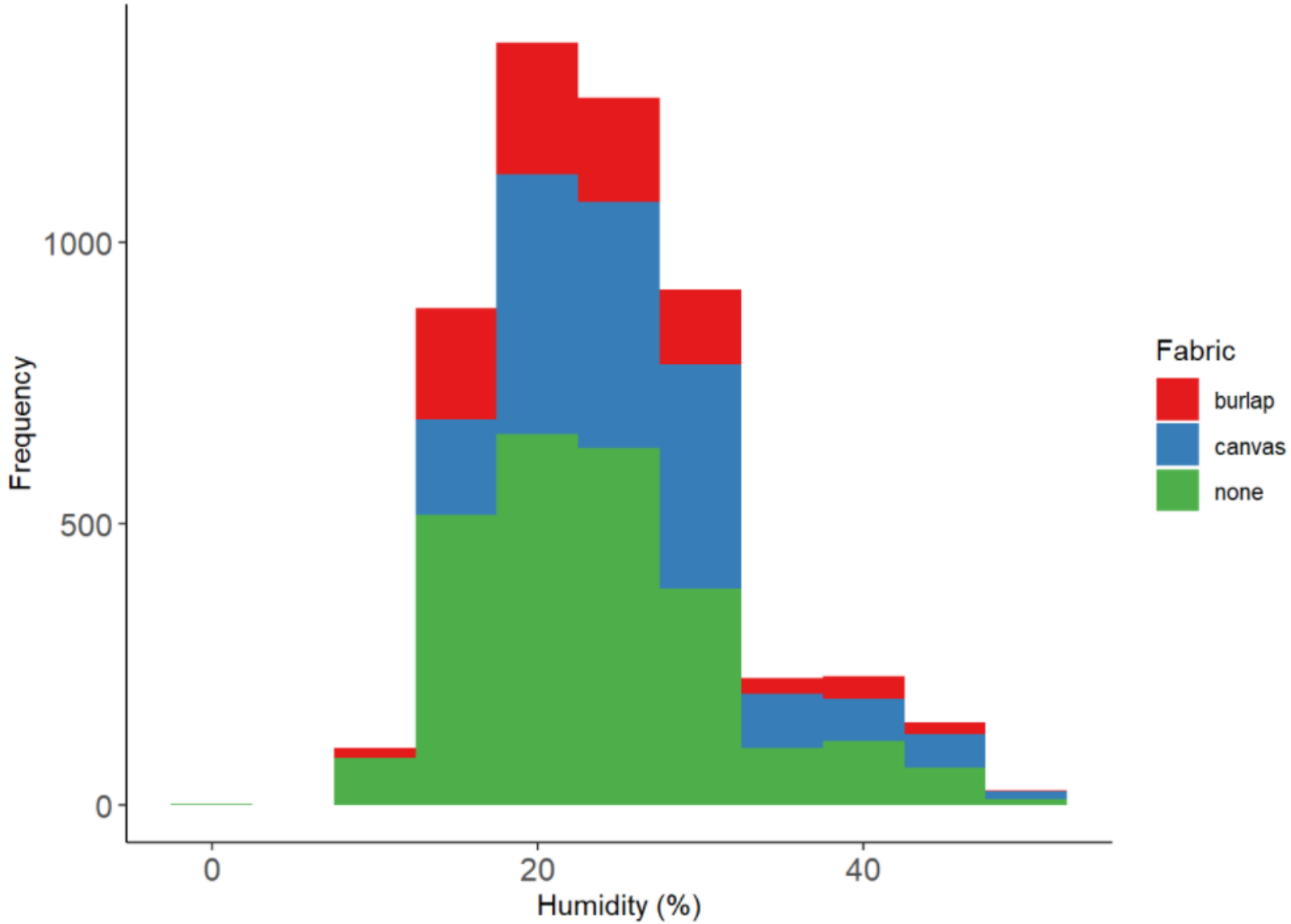
Hypothesis: Fabrics will lower the amplitude of variation in microclimatic parameters such as temperature, RH, and radiation relative to the open. Germination rates of annual plants and foundation species do not differ between different fabrics and it will all be higher than the open gap.

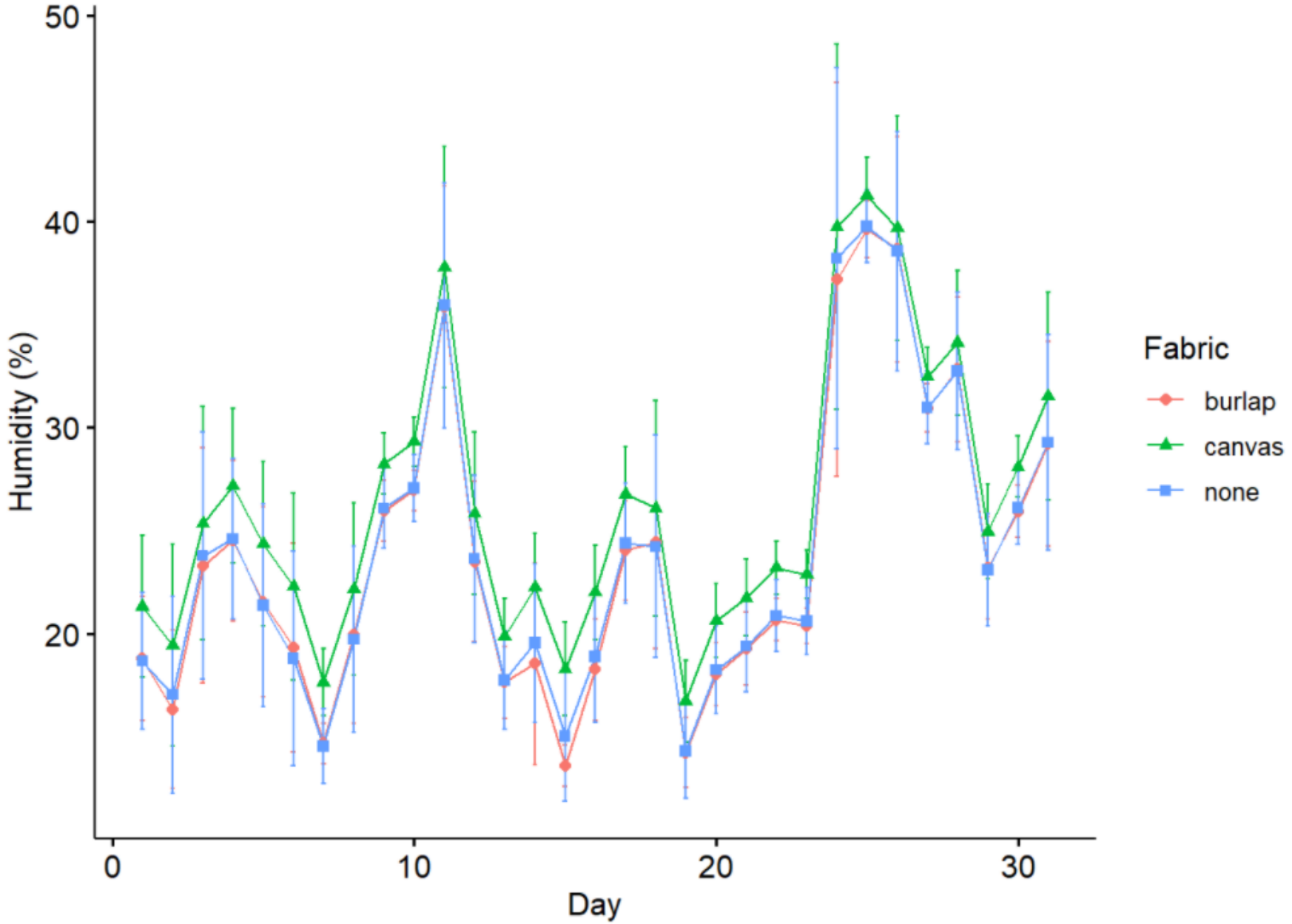

Legend
Temperature/Light Pendant
Temperature/RH Pendant
Burlap Shelter
Canvas Shelter
Nursery Fabric Shelter
Phacelia tanacetifolia
Cylindropuntia acanthocarpa
Open
X3 Rep/month

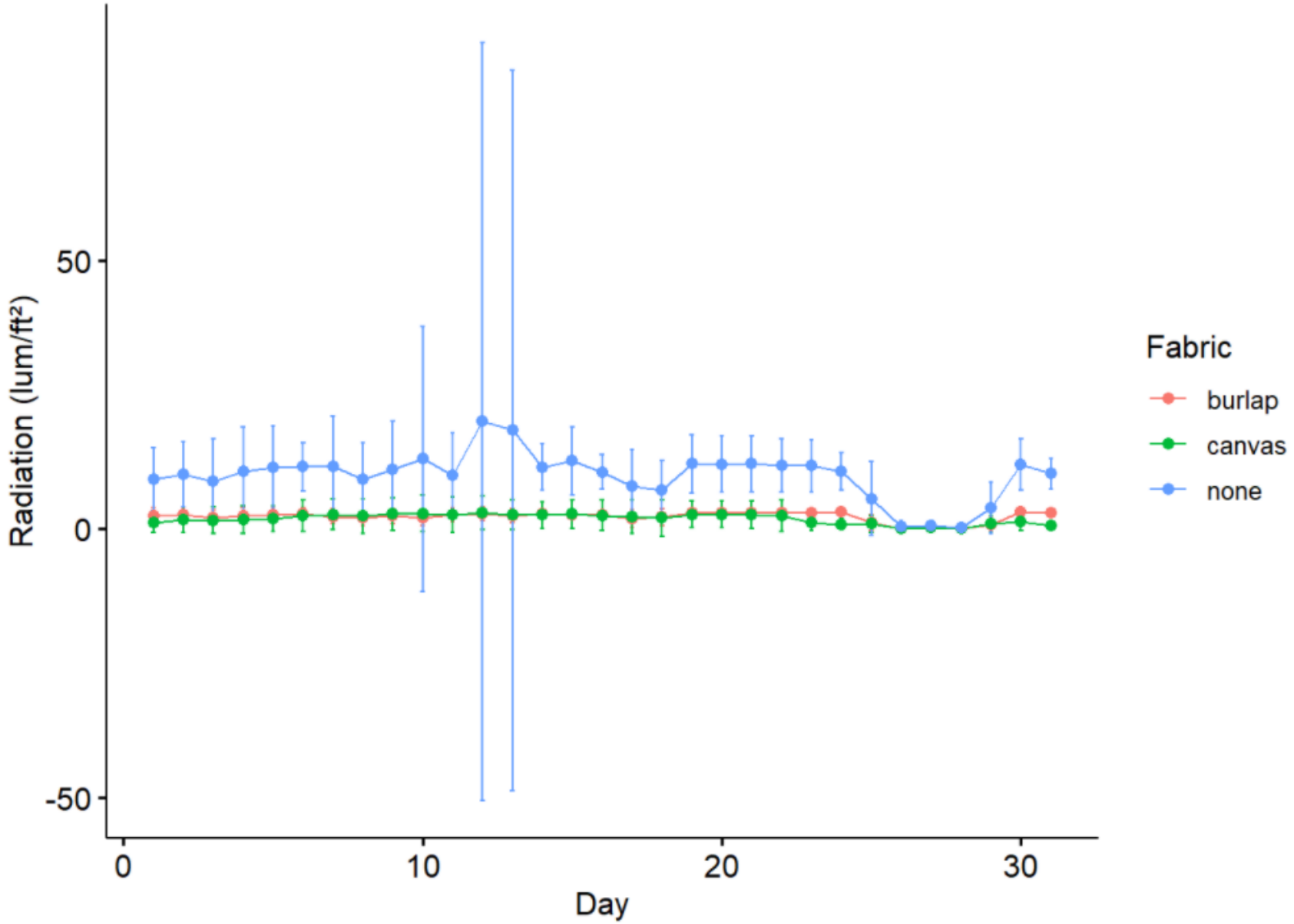
Cylindropuntia acanthocarpa

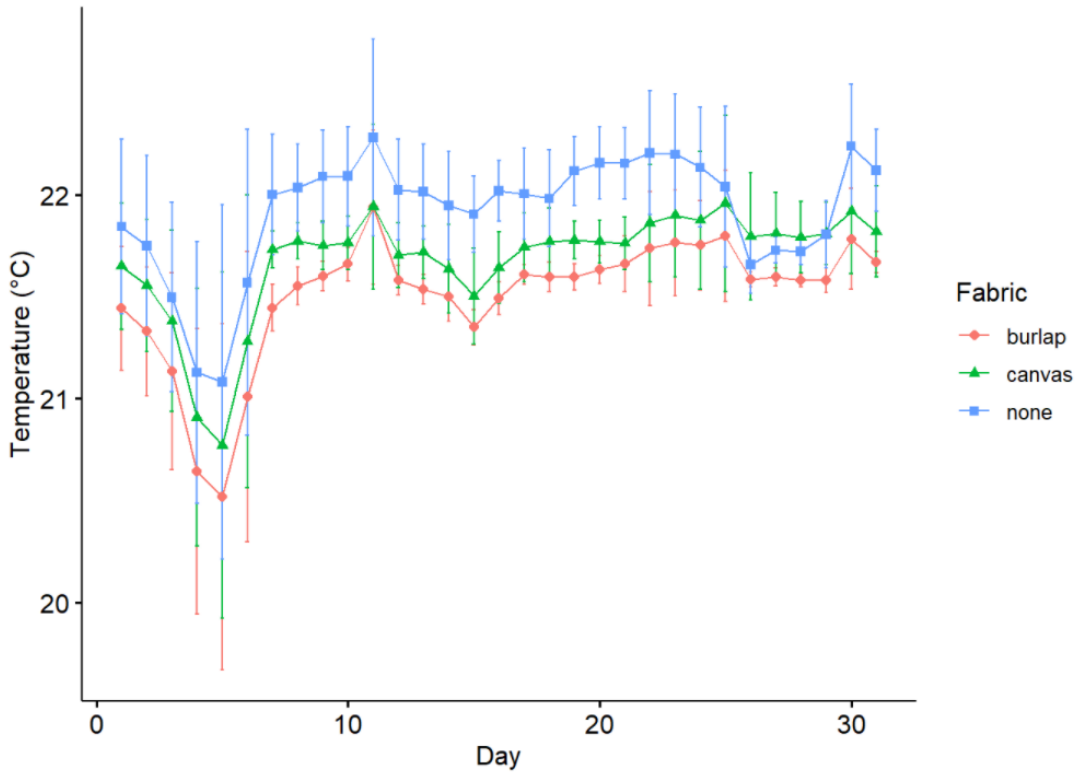
Phacelia tanacetifolia

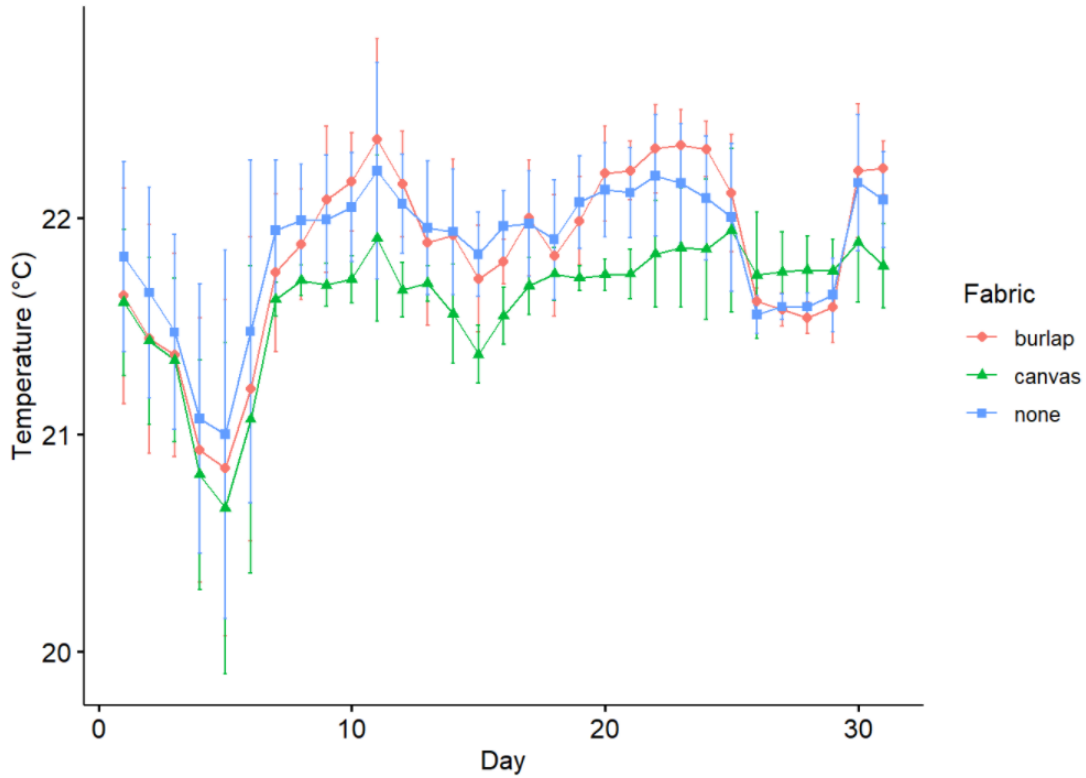

5000
4000
3000
2000
1000
0
Frequency
17.5
20.0
22.5
25.0
27.5
Temperature (°C)
Fabric
burlap
canvas
none

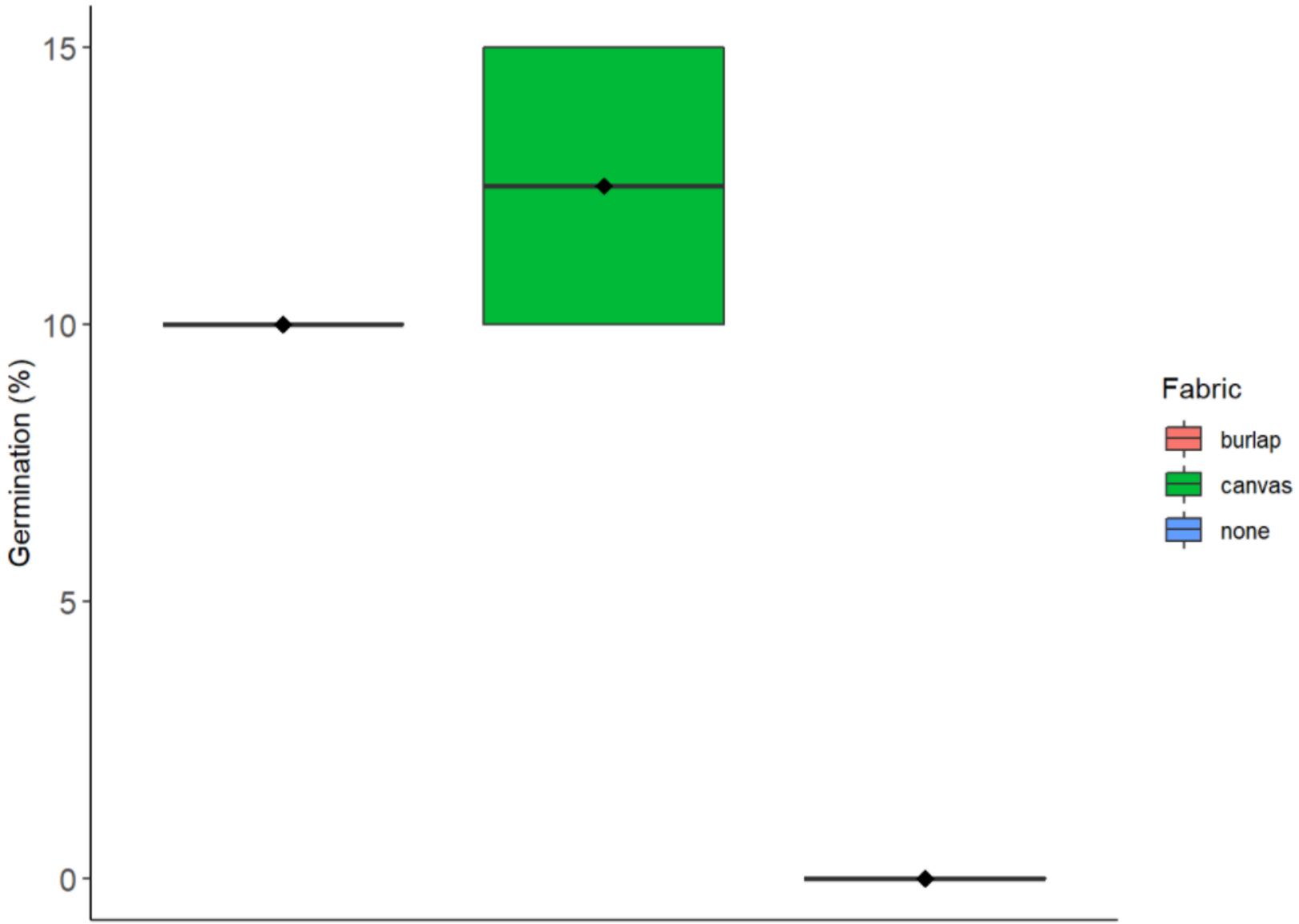

Frequency
1000
500
0
0
20
40
Humidity (%)
Fabric
burlap
canvas
none


50
40
30
20
Humidity (%)
0
10
20
30
Day
Fabric
burlap
canvas
none


Radiation (lum/ft²)
50
0
-50
0
10
20
30
Day
Fabric
burlap
canvas
none


Temperature (°C)
22
21
20
0
10
20
30
Day
Fabric
burlap
canvas
none


Temperature (°C)
22
21
20
0
10
20
30
Day
Fabric
burlap
canvas
none


15
10
5
0
Germination (%)
Fabric
burlap
canvas
none

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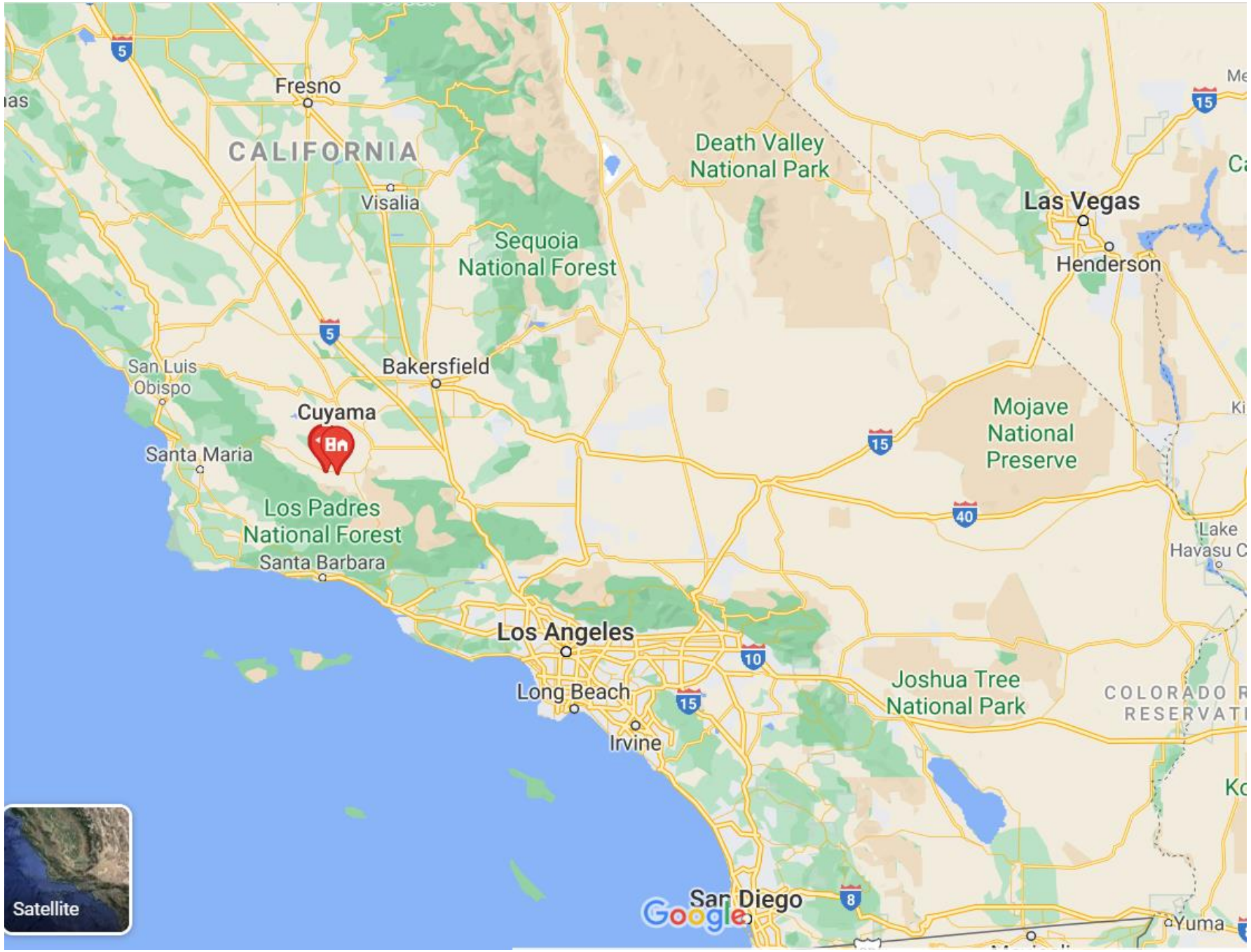
Chapter 3: The impact of artificial shelter deploys on microclimate and patterns in animal habitat usage.

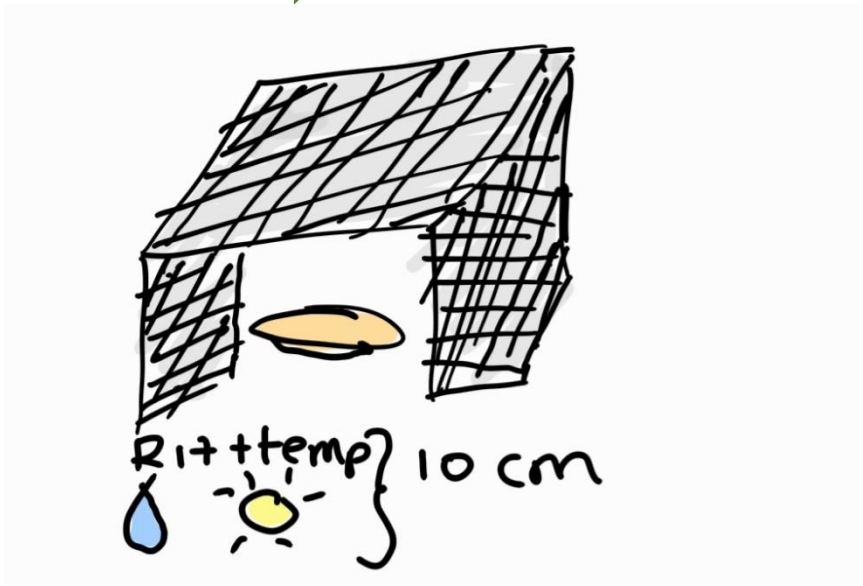

Fresno
CALIFORNIA
Visalia
Death Valley
National Park
Las Vegas
Henderson
Sequoia
National Forest
San Luis
Obispo
Bakersfield
Cuyama
Santa Maria
Mojave
National
Preserve
Los Padres
National Forest
Santa Barbara
Lake
Havasu C
Los Angeles
Long Beach
Irvine
Joshua Tree
National Park
COLORADO R
RESERVATI
San Diego
Yuma
Satellite
Google

Purpose: To examine wildlife interactions with artificial shelters and to investigate how artificial shelters impact the soil microbial community.

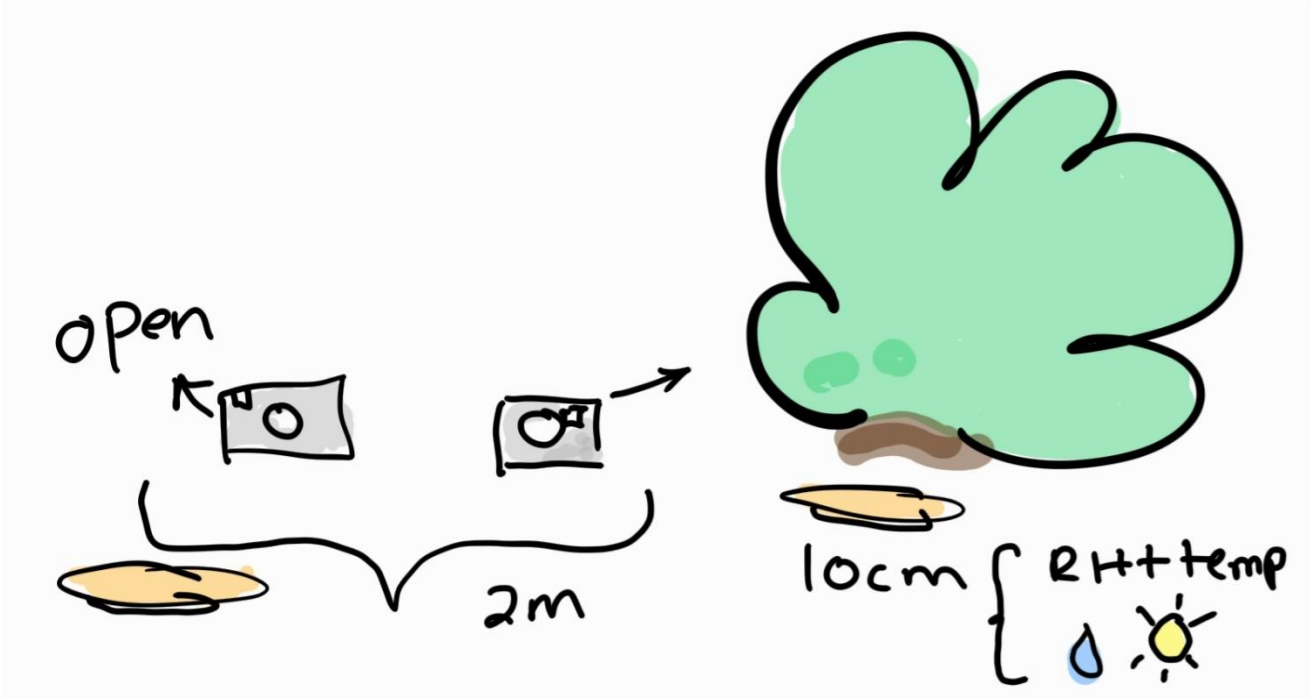
Questions: How do UV permeable artificial shelters modify the soil microbial community richness and abundance? How often do vertebrates interact with artificial shelters? Which species interact with shelters the most often? What are they doing when interacting with shelters? Do arthropods interact with shelters? If yes, which species do most often? Does the richness and abundance of microbes differ between shelters, shrubs, and the open gap? Is the frequency and direction of vertebrate and arthropod interaction with shelters different from shrubs and the open?

Hypothesis: Animals will associate more with shelter microsites and shrubs than the open as canopied microsites ameliorate the microclimatic environment of the understory.

Winning Fabric



12 shelters

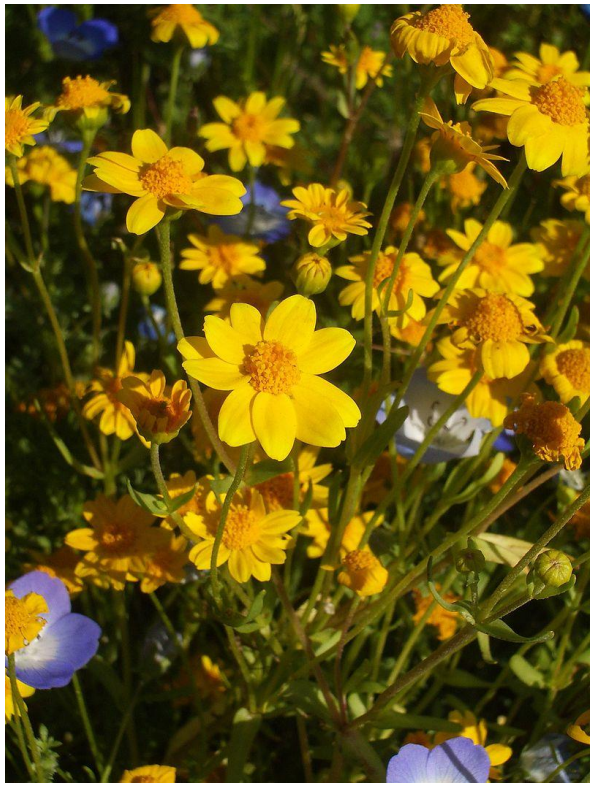


12 shrubs/open

Chapter 4: Effects of shelter on understory plant germination.

Possible Plants Species

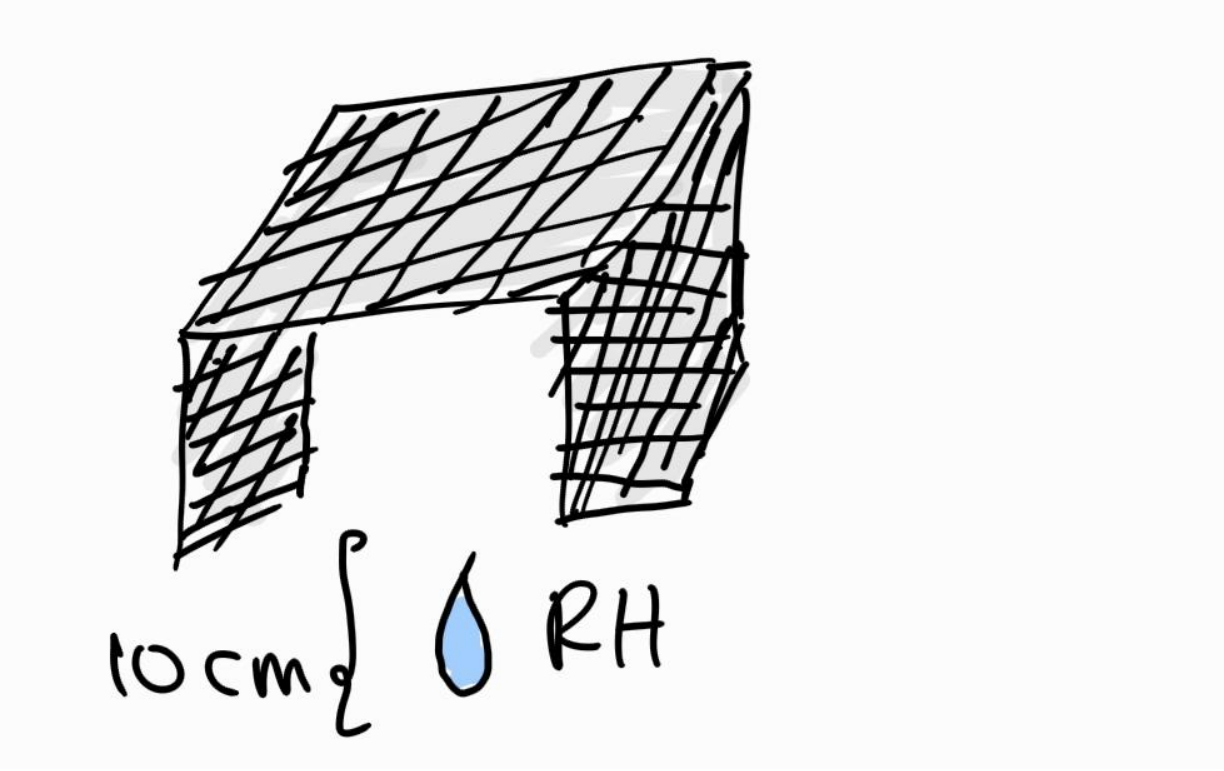
Phacelia tanacetifolia



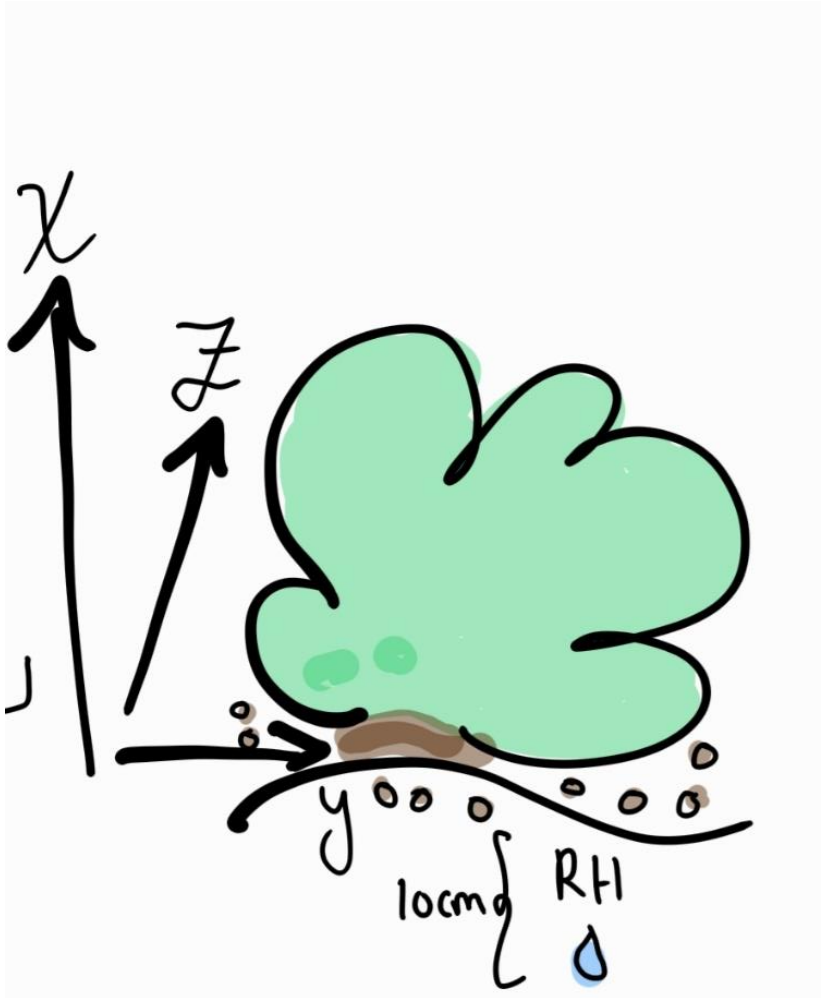
Lasthenia californica

?

Water the microsite regularly



12 shelters



12 shrubs/open

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Chapter 5 (Bonus): A synthesis of shelter amelioration for animals.

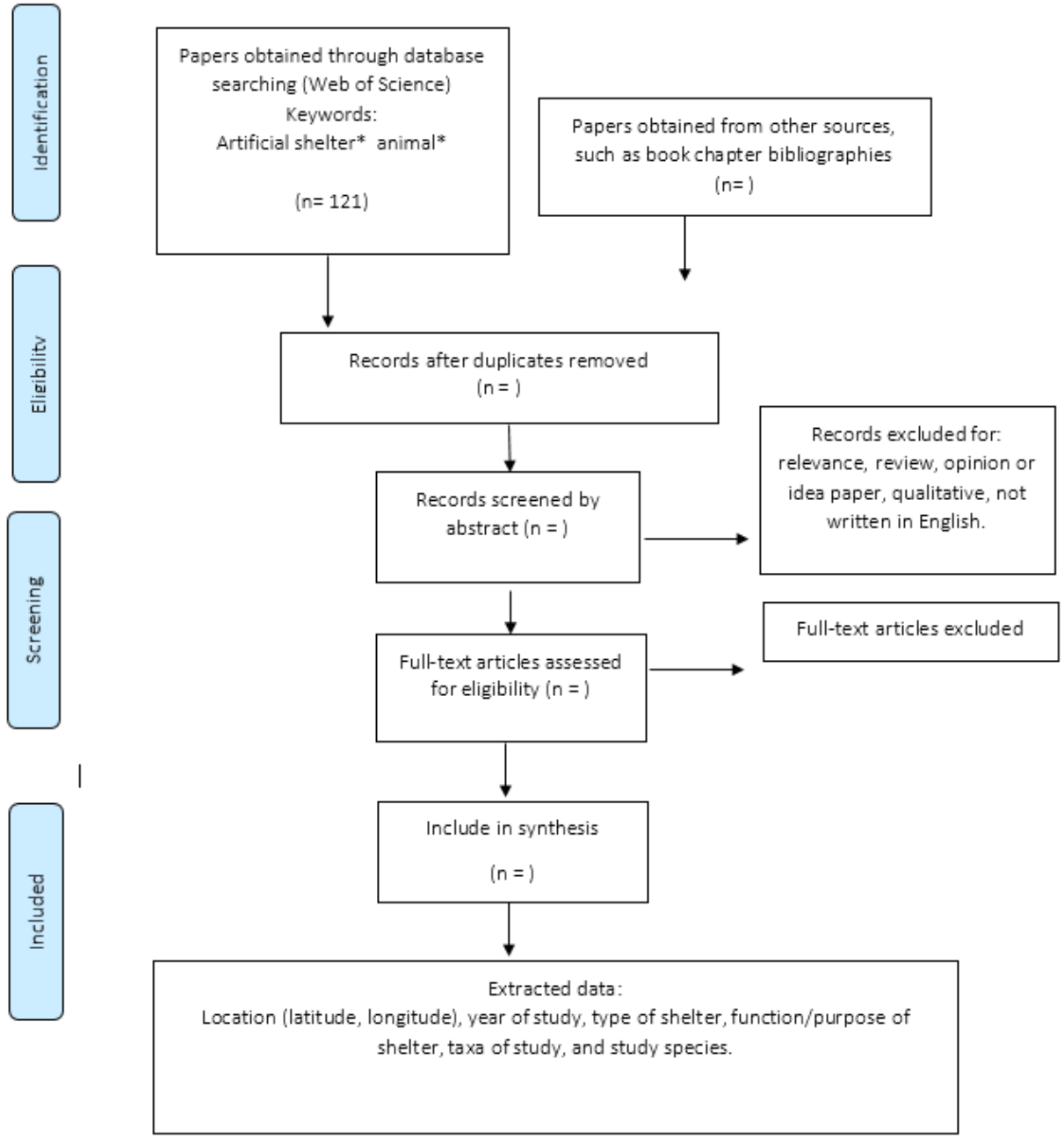

Figure 1. PRISMA adapted from Moher et al. (2009).

Timeline	Chapter	What needs to be done
May	Chapter 1	• Edit • Submit to MEE
Late June-August	Chapter 2	• Finish lab experiment • Statistical analyses • Write first draft • Submit to Journal
Late July/August-December/January	Chapter 5	• Start systematic review and compile data • Do some stats • Maybe write first draft
February-March	Chapter 3 and 4	• First field season 2022 • One site: Mojave
	Chapter 3 and 4	• Second field season 2023 • Cuyama

Thank You!


CS508244
HOME
&
GARDEN
WILDT
"We really need more perennials? Aren't my weeds and crabgrass enough?"