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Shrub encroachment:
Using robust ruminants to preserve mountain pastures under global change conditions

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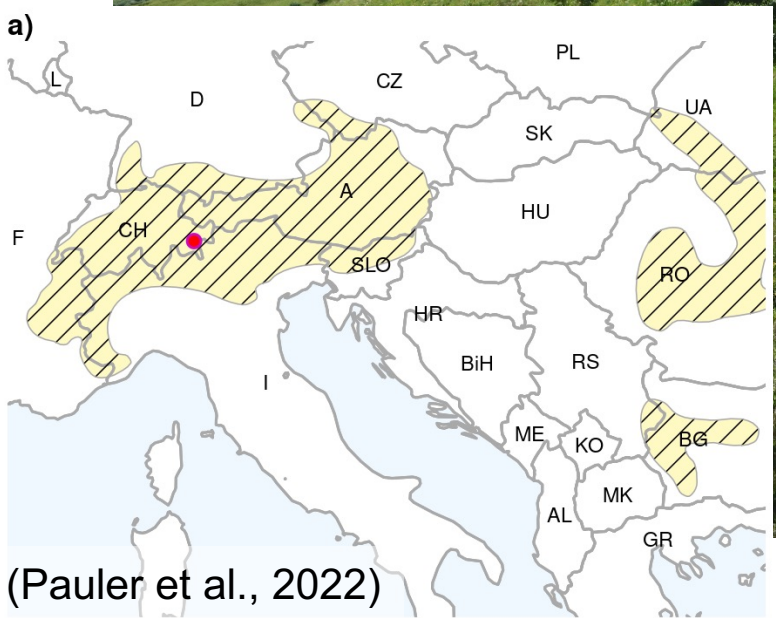
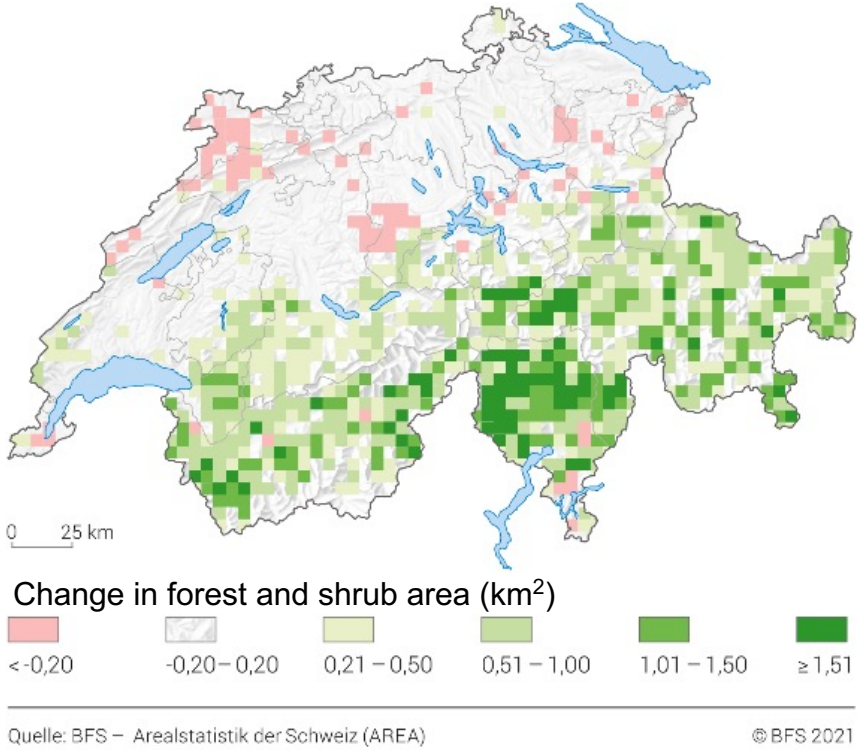
Shrub encroachment in European Alps



(Pauler et al., 2022)

Wooded areas 1985-2018

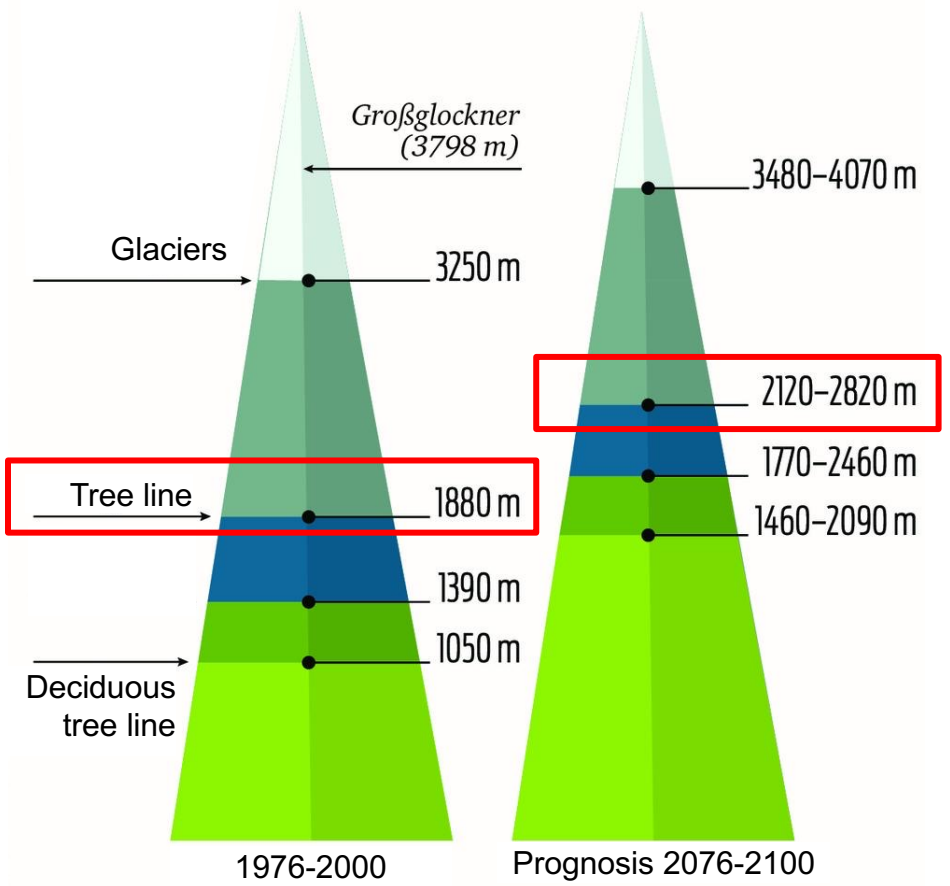


Dominant species (Brändli et al., 2013)
70 % green alder (*Alnus viridis*)
20 % dwarf pine (*Pinus mugo*)
10 % others

Background

Reasons for encroachment:
Climate change

Tree line shift in one century:
+250 m

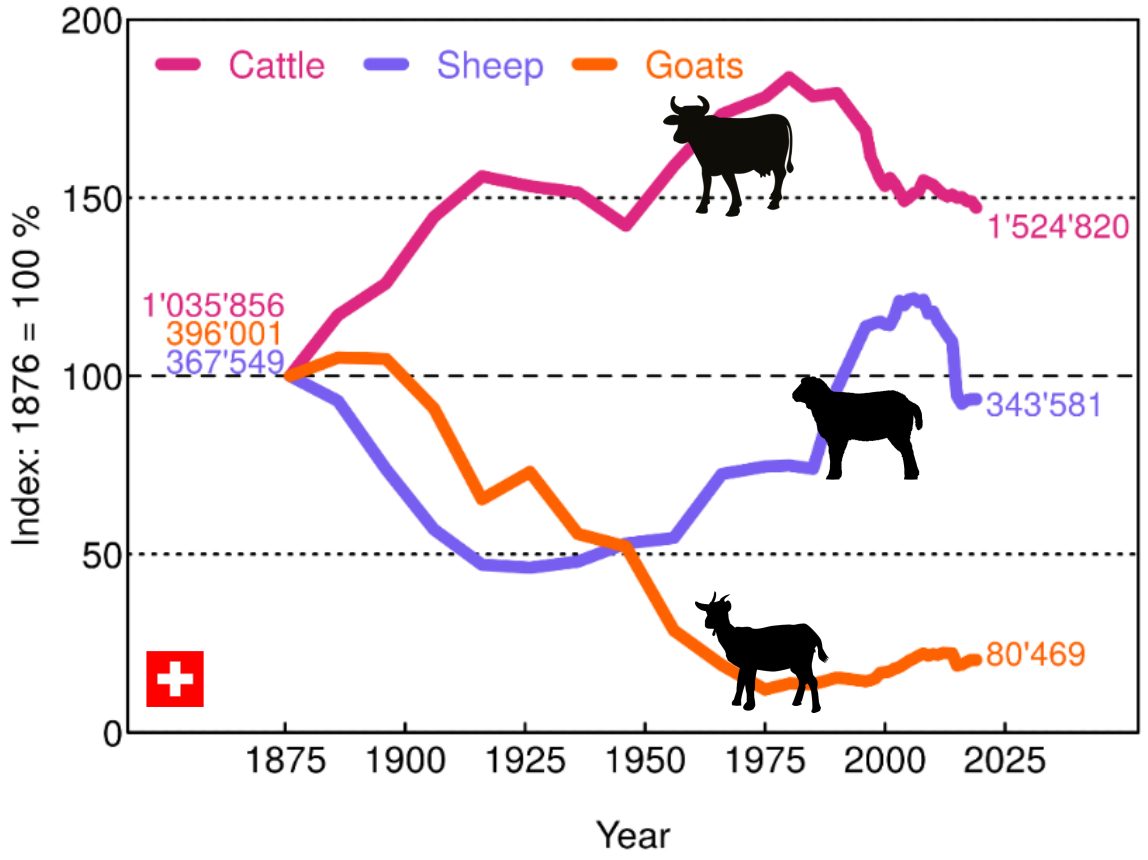


Grafik: Eber, Quelle: Quelle: Prof. Dr. Franz Rubel, Climate Change and Infectious Diseases Group, Institute for Veterinary Public Health, University of Veterinary Medicine Vienna

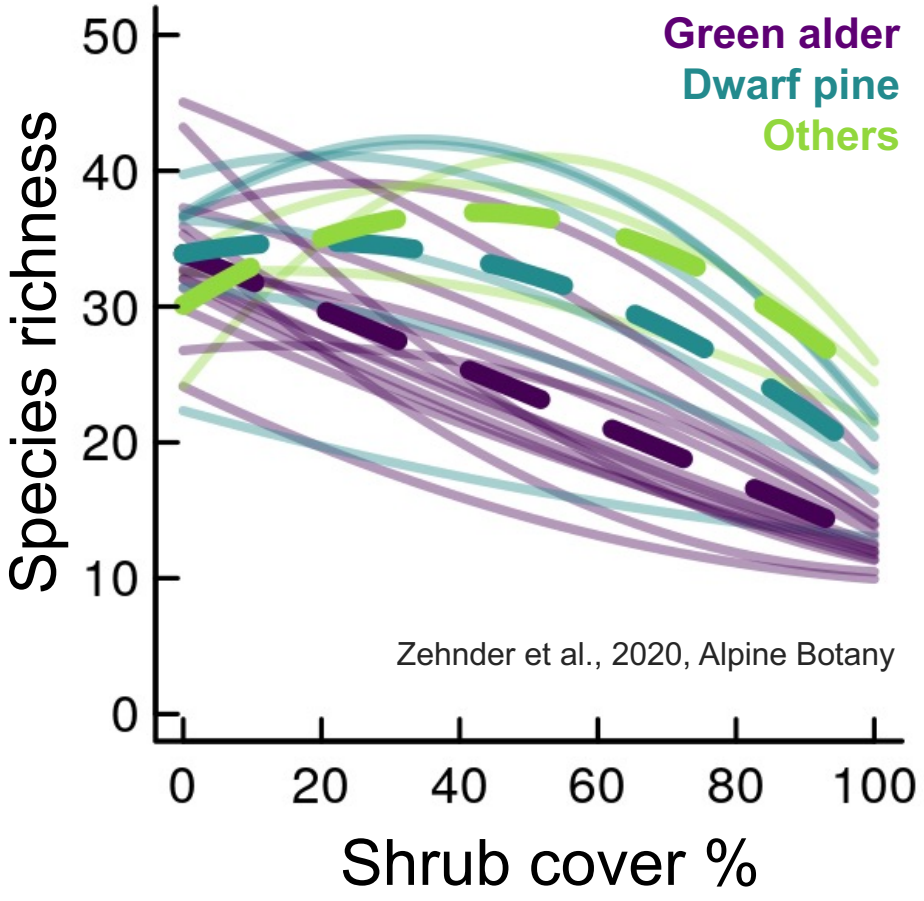
Background

Reasons for encroachment:
Land-use change

→ less goats consuming shrubs
→ less animals on marginal lands



Consequences of green alder invasion



Consequences

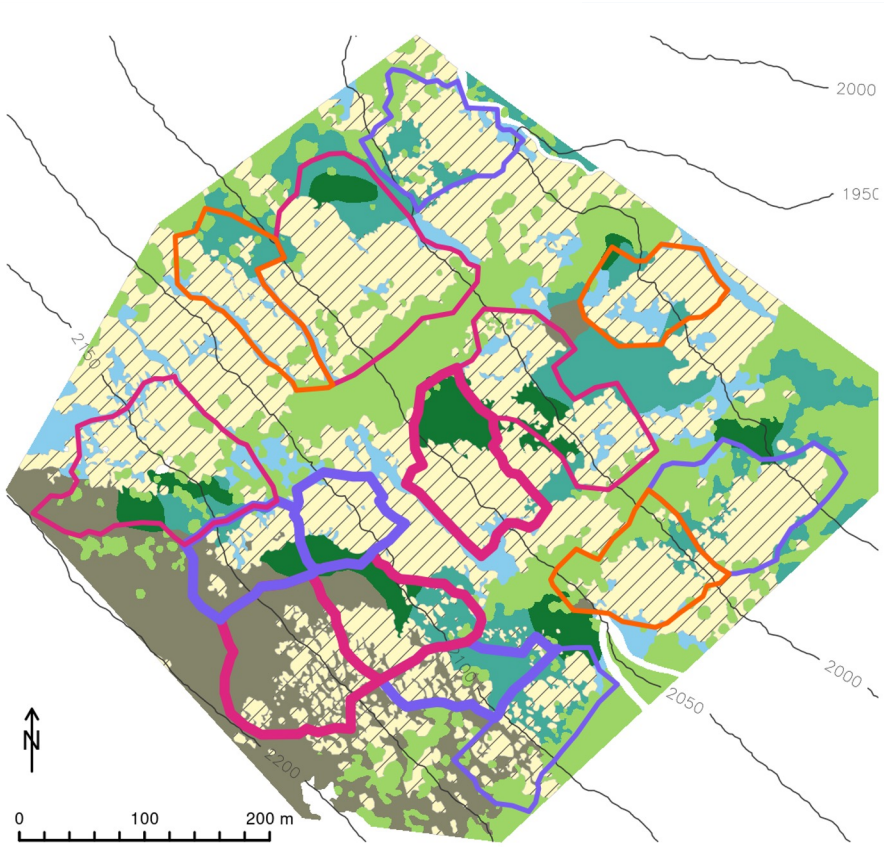
- Loss of biodiversity
- Loss of pastureland
- Less aesthetic
- Eutrophication
- Greenhouse gas emission
- Dead end of succession

Solution: Site-adapted grazing

Open questions:

- Sufficient forage quantity and quality?
- Which livestock and management is “site-adapted”?
  - Who visits green alder voluntarily?
  - Which species debarks green alder?
  - Impact of stocking density?

Methods: Grazing experiment



Dexter cattle, low stocking rate
Dexter cattle, high stocking rate
Engadine sheep, low stocking rate
Engadine sheep, high stocking rate
Pfauen goats, low stocking rate

Contour lines (50m)

Alnus viridis shrubs

Forest
Dwarf shrubs
Fertile pasture
Nutrient-poor pastures
Wet pastures

Livestock:
2 cattle herds
2 sheep herds
1 goat herds

15 paddocks
Independent rotations
High / low stocking density

- Vegetation mapping
- Forage analysis
- Movement behaviour (GPS)
- Debarking
- Weight gain
- Meat & carcass quality


Dexter cattle


Engadine sheep


Pfauen goats

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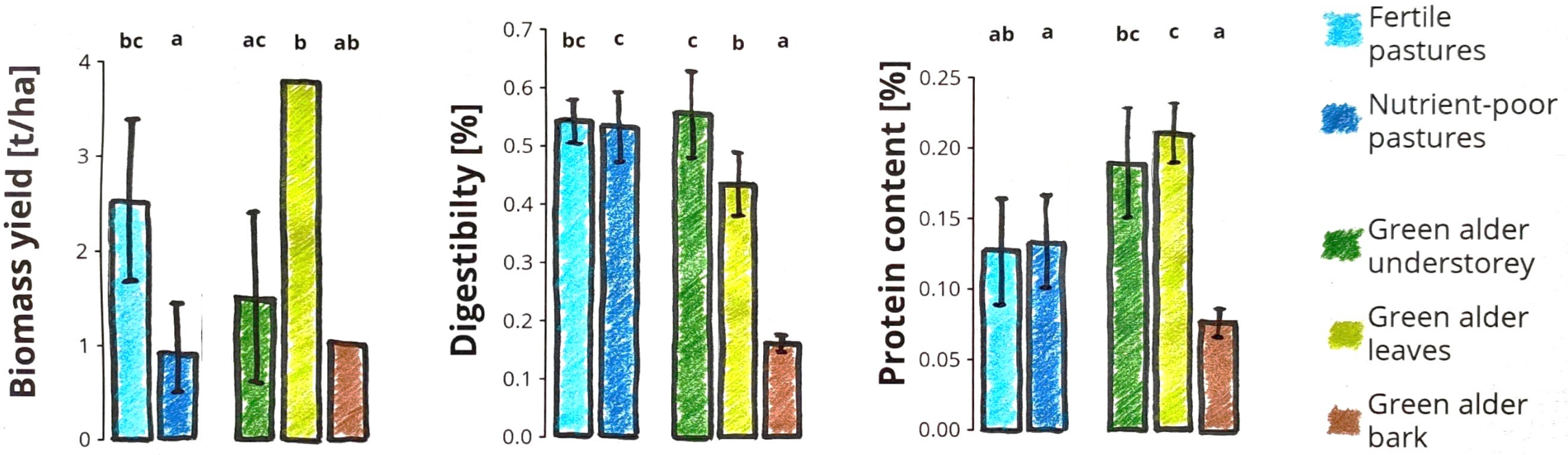
Sufficient forage quantity and quality?



Green alder leaves offer more biomass than open pasture

Understorey + leave digestibility compar-able to pastures

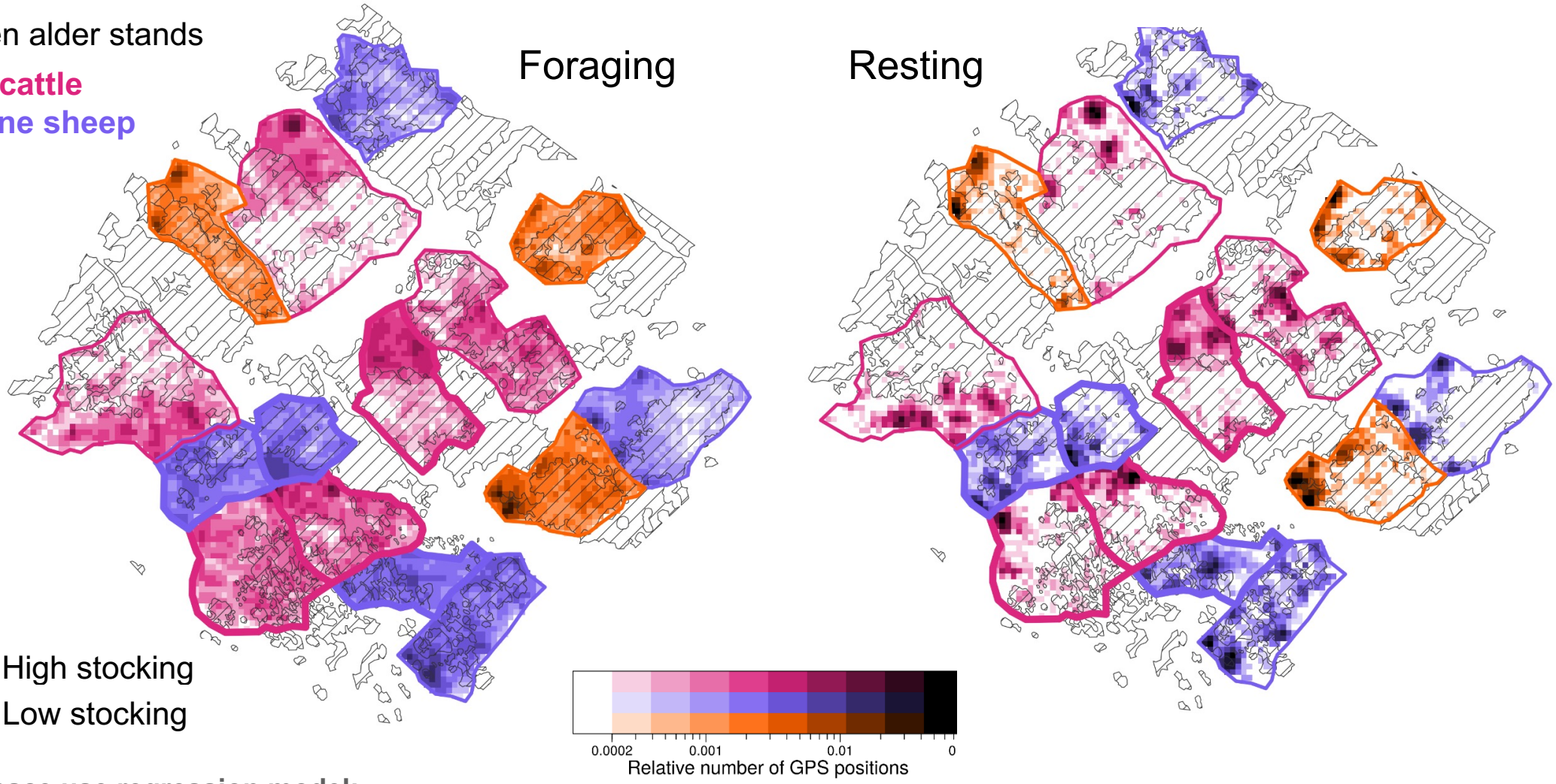
Protein content higher than open pasture

Zehnder et al., 2016

Which species visits green alder voluntarily?

Green alder stands

Dexter cattle
Engadine sheep
Goats

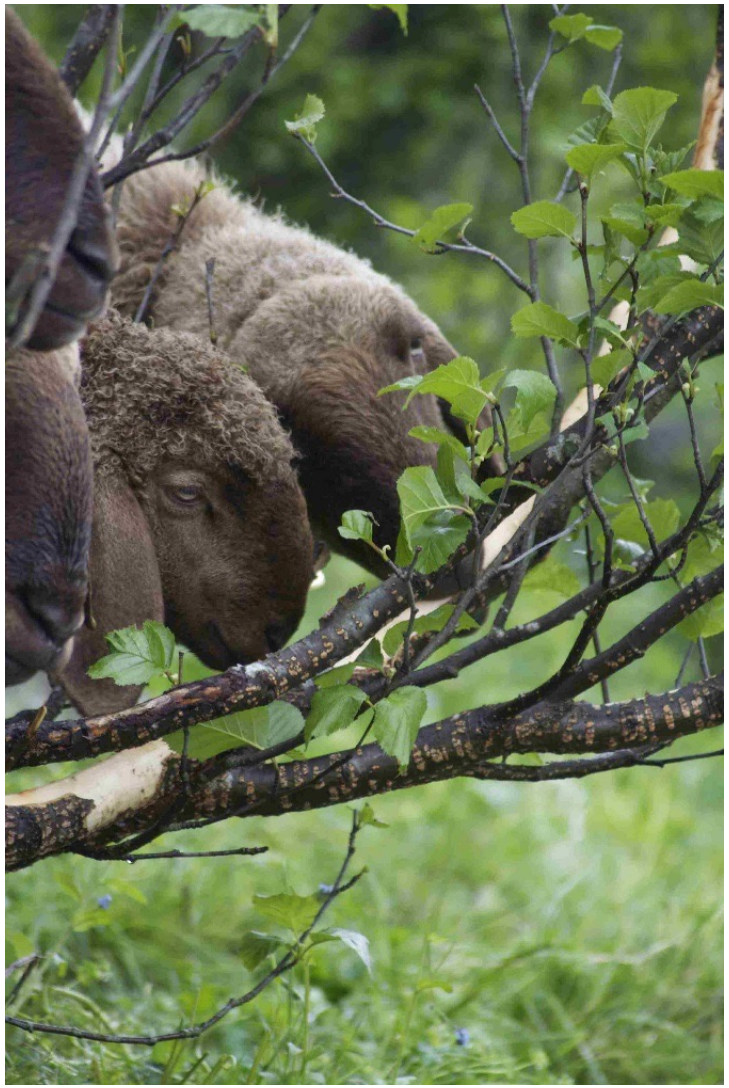


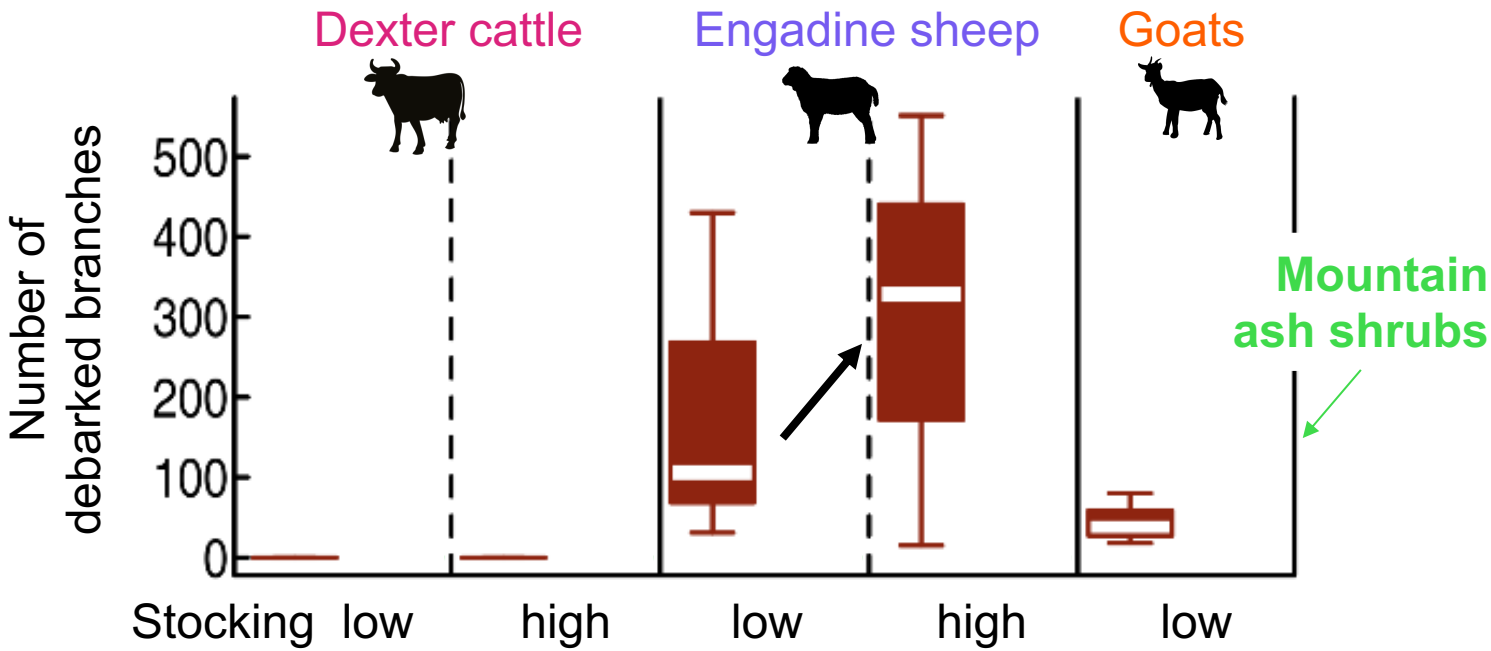
Space use regression model:

Green alder visit:  // High stocking rate > low stocking rate

Which species debarks green alder most?

Which species debarks green alder most?





→ Dexter cattle did not debark shrubs.

→ Engadine sheep debarked most green alder (positive effect of stocking density).

→ Goats prefer mountain ash shrubs.

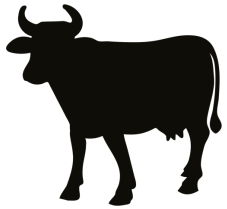
Suitability for different management goals

Management goal	 Dexter cattle	 Pfauen goats	 Engadine sheep
Pastureland use by grazing in shrubs	✓	✓✓	✓✓

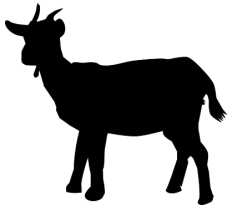
Conclusions

Forage yield and quality of green alder and its understory is an underestimated forage resource.

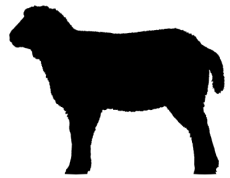
Cattle prefer open pasture and feed shrub leaves only.



Goats destroy shrubs by debarking, but prefer forest trees.



Engadine sheep debark green alder more than goats, without destroying forest trees.



Choice of livestock depends on management goals. Engadine sheep are ideal for recreating both, mountain forest and biodiverse open pastures.

Thank you for your attention

Pauler et al., 2022
J. Appl. Ecology

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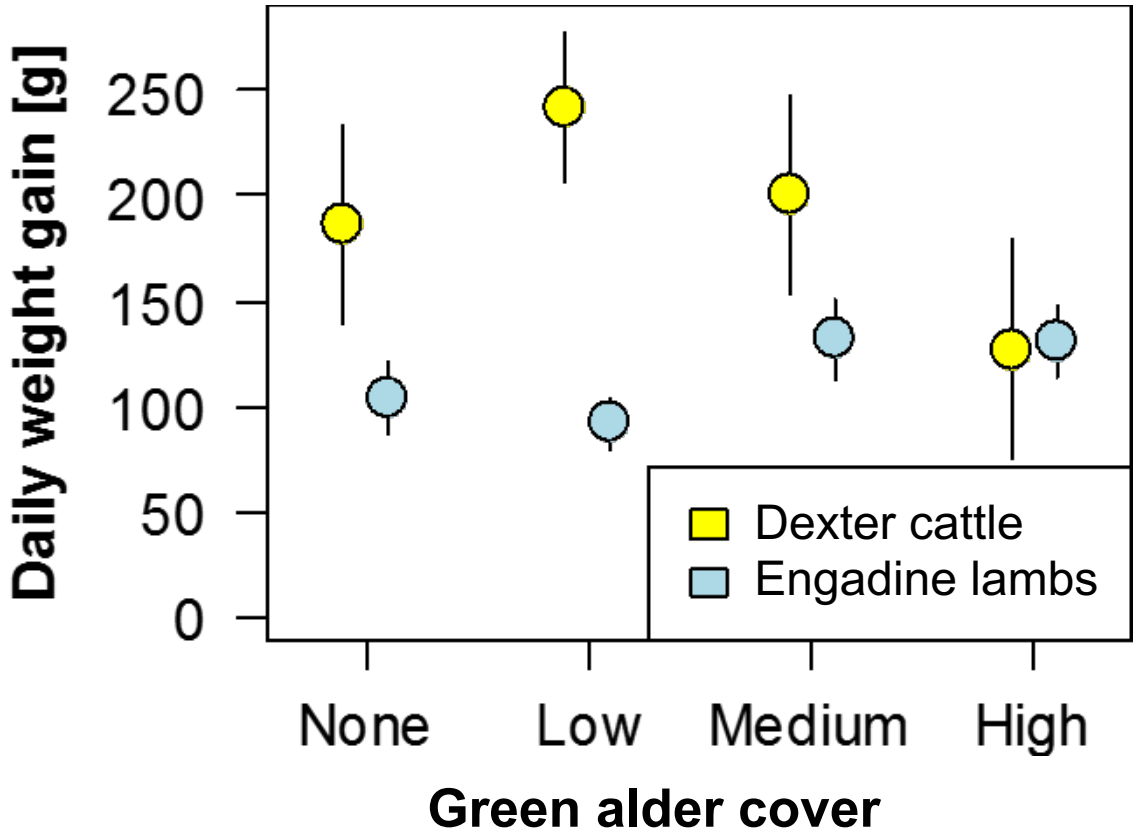
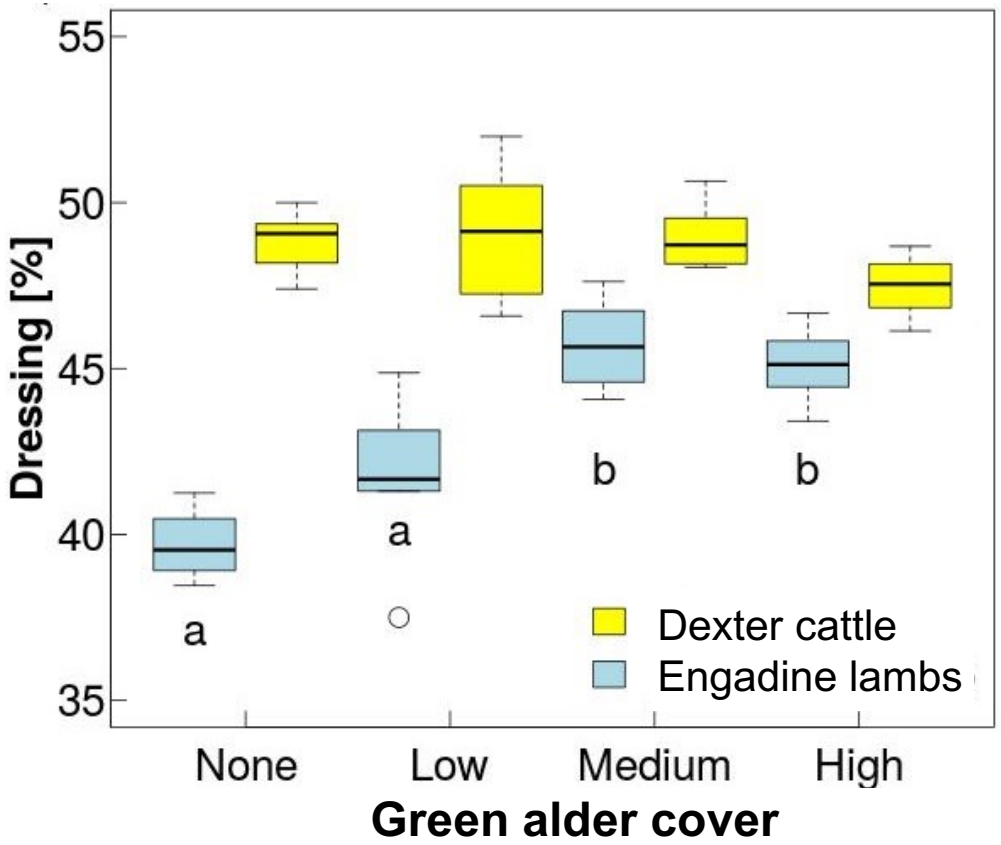
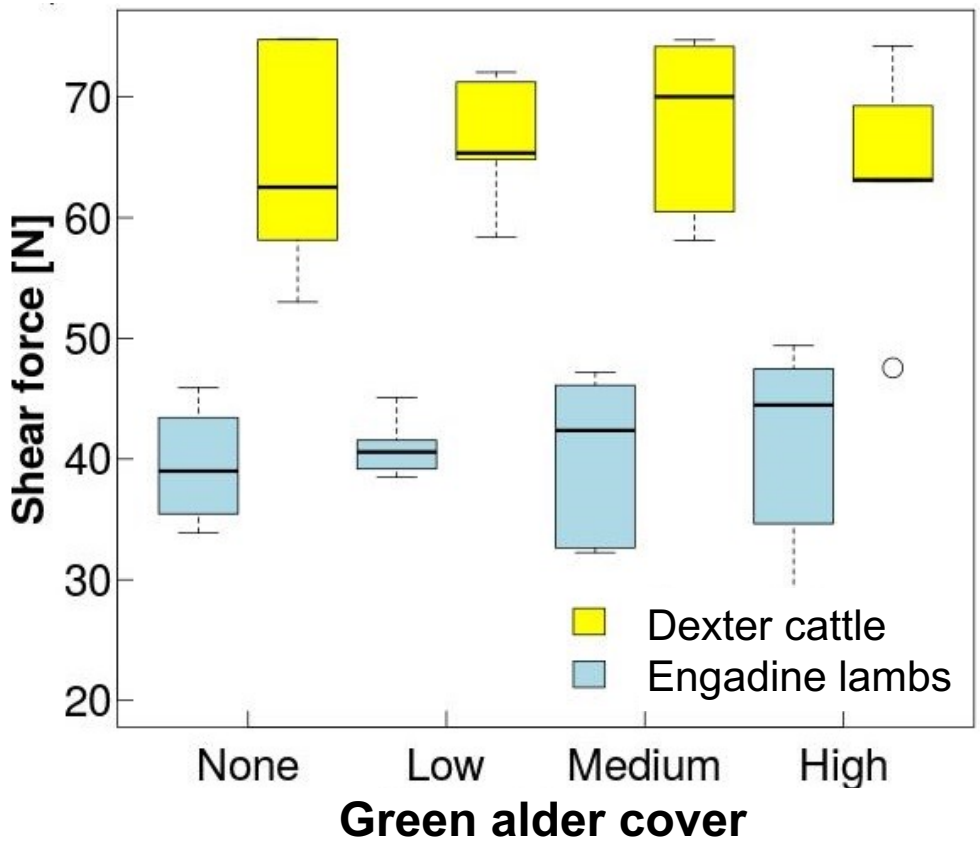
Results: Animal growth



No significant differences in daily weight gain

Results: Carcass and meat quality





No significant differences in driploss and cookloss in cattle and lambs.