

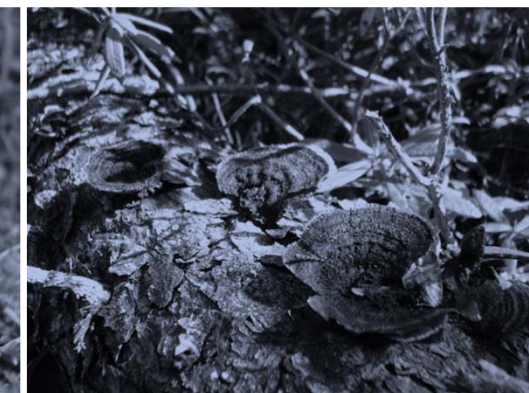
Home range and stand scale effects of coarse woody debris on boreal small mammals

Dominique Fauteux¹, Louis Imbeau¹, Pierre Drapeau², Marc J. Mazerolle¹

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Québec

¹: UQAT, Chaire AFD et CEF

²: UQAM, Chaire AFD et CEF

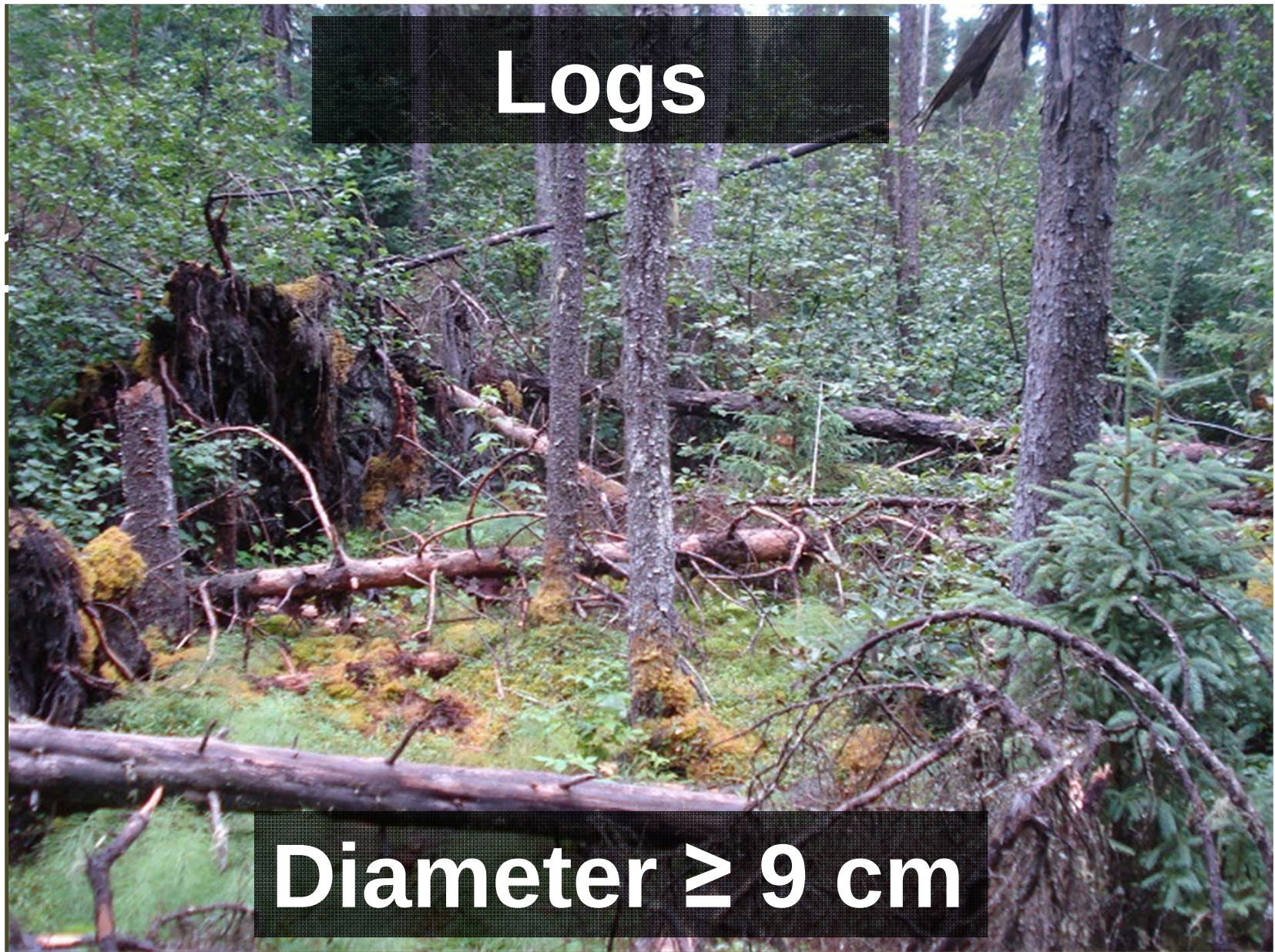


Definitions

Definitions

1 - Coarse woody debris

Coarse woody debris

A photograph of a forest floor covered in coarse woody debris. Several large logs and branches are scattered across the ground, which is also covered in green moss and small plants. The background shows a dense forest with tall trees.

Logs

Diameter ≥ 9 cm

Definitions

Definitions

1 - Coarse woody debris

2 - Partial cut

Partial cut



$\approx 33\%$ green-tree retention

Definitions

Definitions

1 - Coarse woody debris

2 - Partial cut

3 - Small mammals

Small mammals



Small mammals and dead wood

Coarse woody debris (CWD)

- Important forest floor structure
- Beneficial for many taxa
- For small mammals:
 - Cover and protection
 - Nesting
 - Food
 - Humidity
 - Movement



Small mammals and dead wood

Effects of tree removal:



- Small mammals → often used as indicators
e.g. Red-backed voles = old forests

Effects of tree removal

— : Fuller *et al.* (2004), Sullivan *et al.* (2008)

≈ : Steventon *et al.* (1998), Gitzen *et al.* (2007)

+ : Kirkland (1990), Kaminski *et al.* (2007)

- Negative effects mitigated by CWD?

Effects of CWD

Objective:

Determine the effects of CWD on small mammals in managed and control stands.

Prediction:

+ CWD = + small mammals (in all treatments)

Methodology

Location

Study area:

- Jamésie
- Spruce-moss domain

We are here!

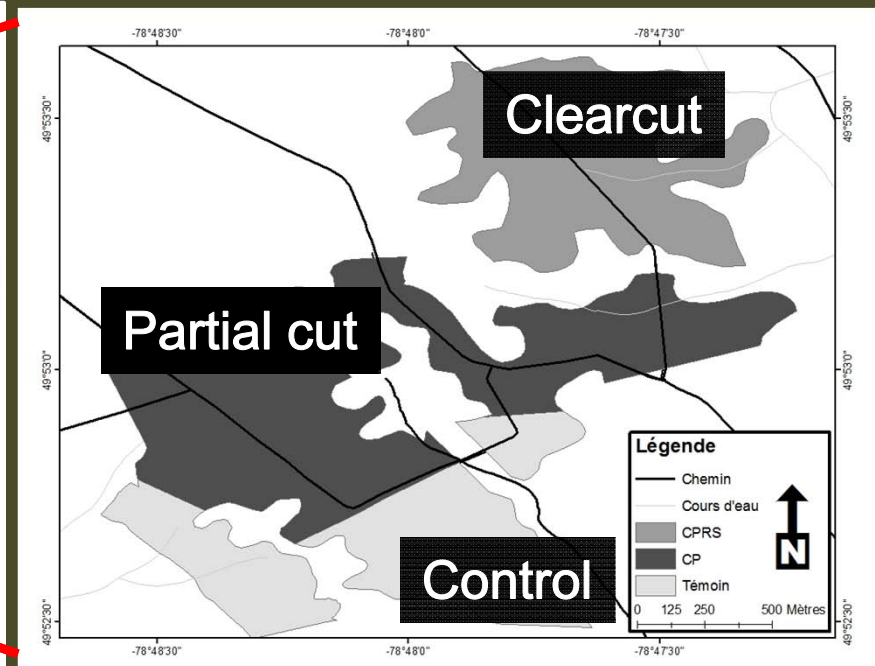
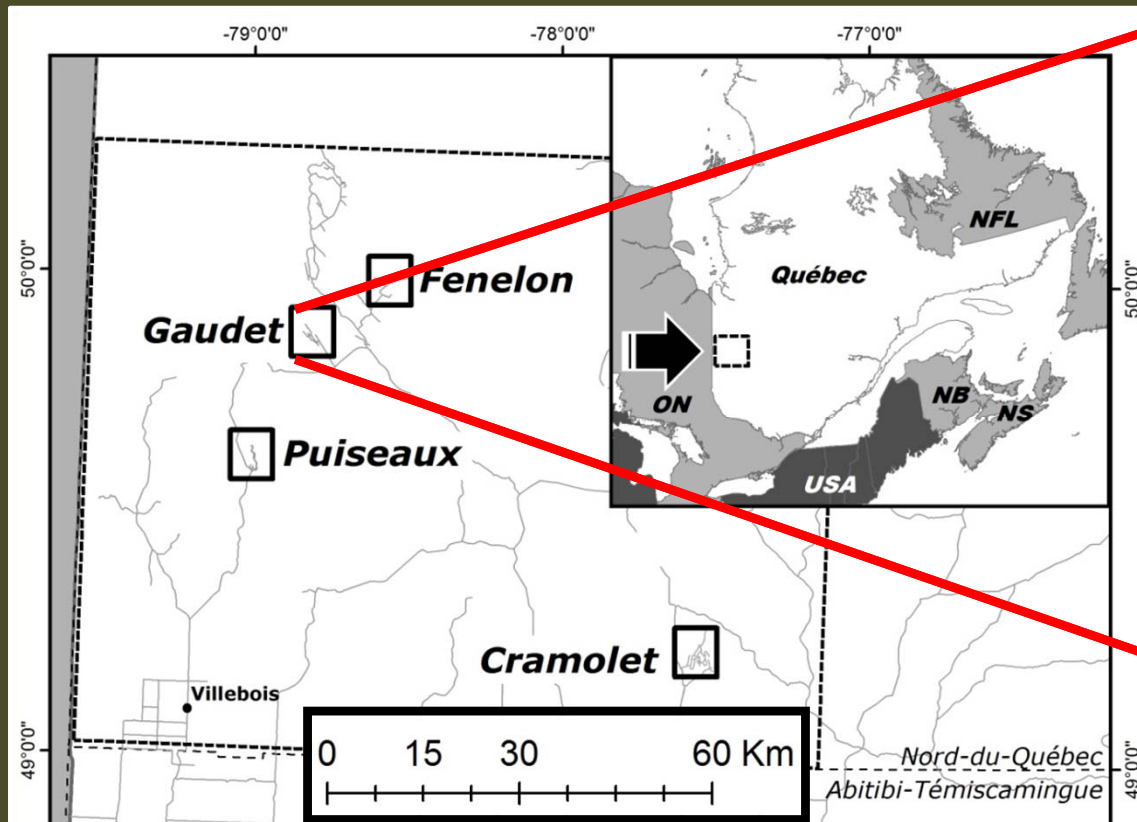


Methodology

Trapping system

a. Partial cut network (4 blocks)

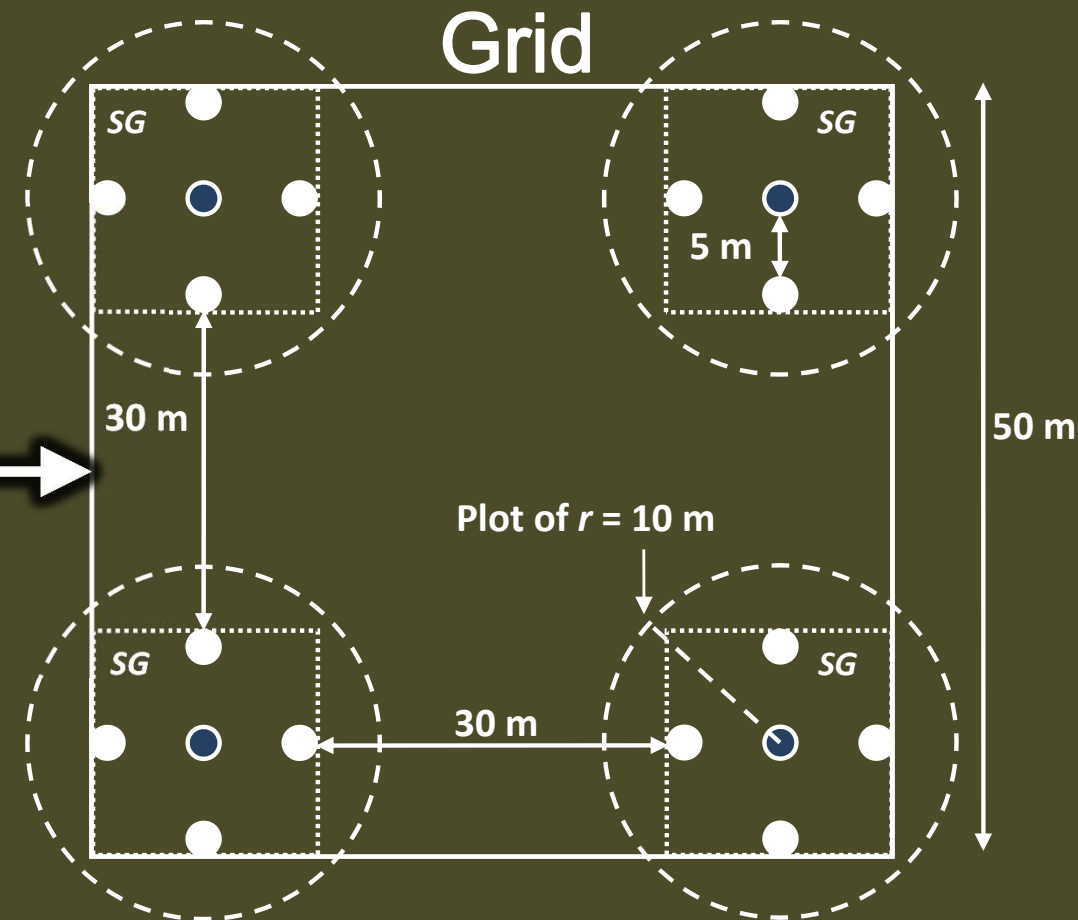
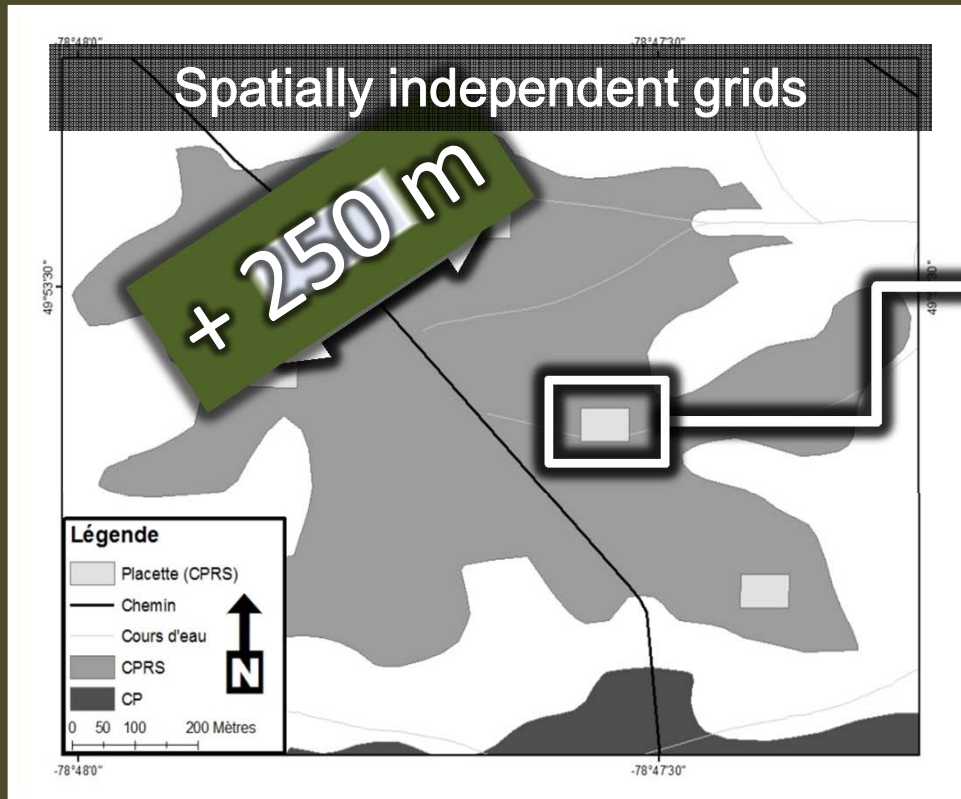
b. 3 treatments / block



Methodology

Trapping system

- c. 4 grids divided in 4 sub-grids ($n_{tot} = 48$ grids)



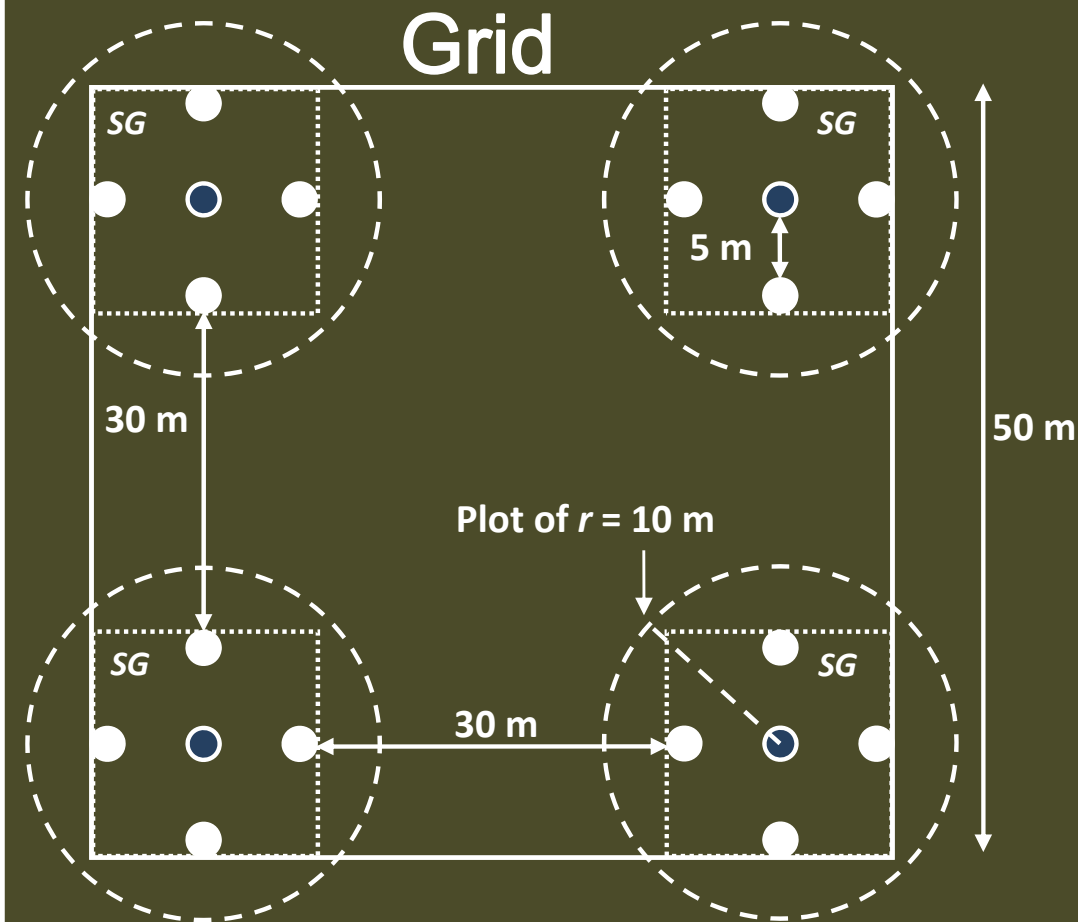
Methodology

Trapping system

Habitat use:

Home range scale: sub-grid

Stand scale: grid



Methodology

Trapping system

e. Sampling

Temporal sampling effort (for each trapping grid)				
2009		2010		
Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
3 nights	3 nights	3 nights	3 nights	3 nights

Methodology

Statistics: Analyses of captures

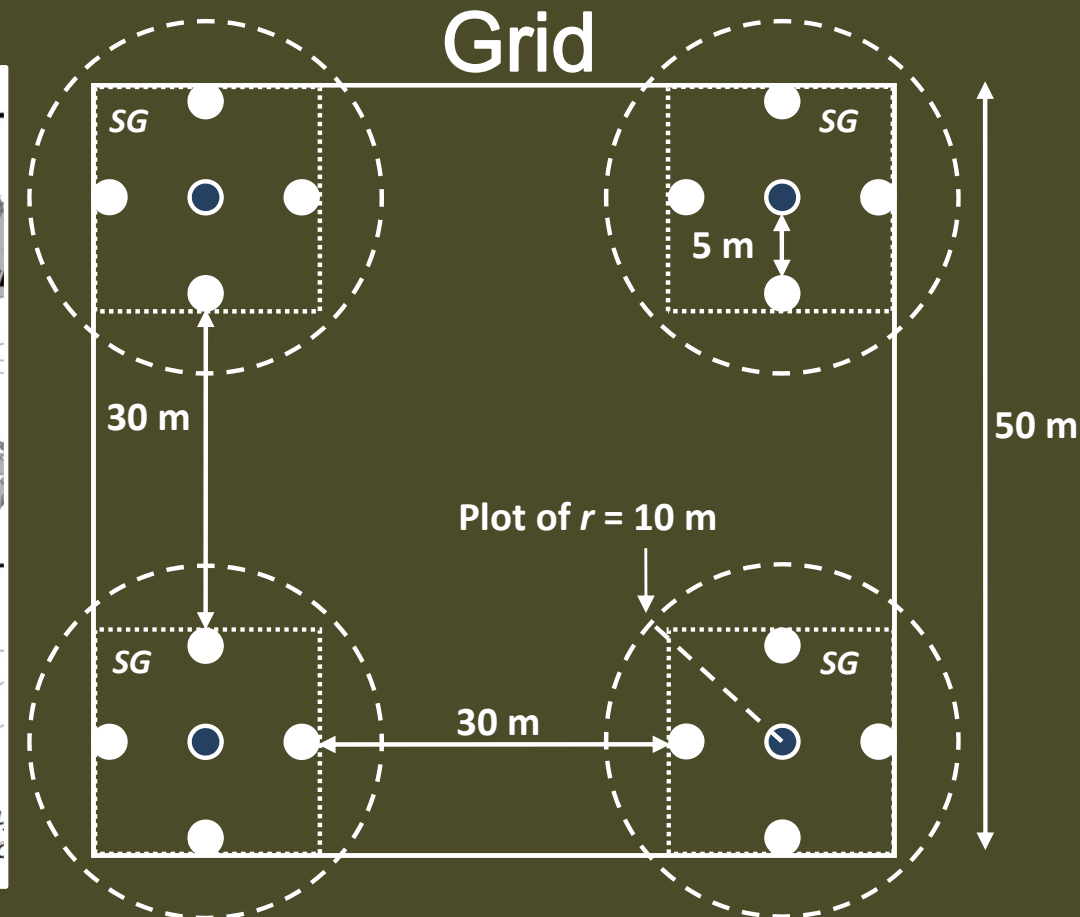
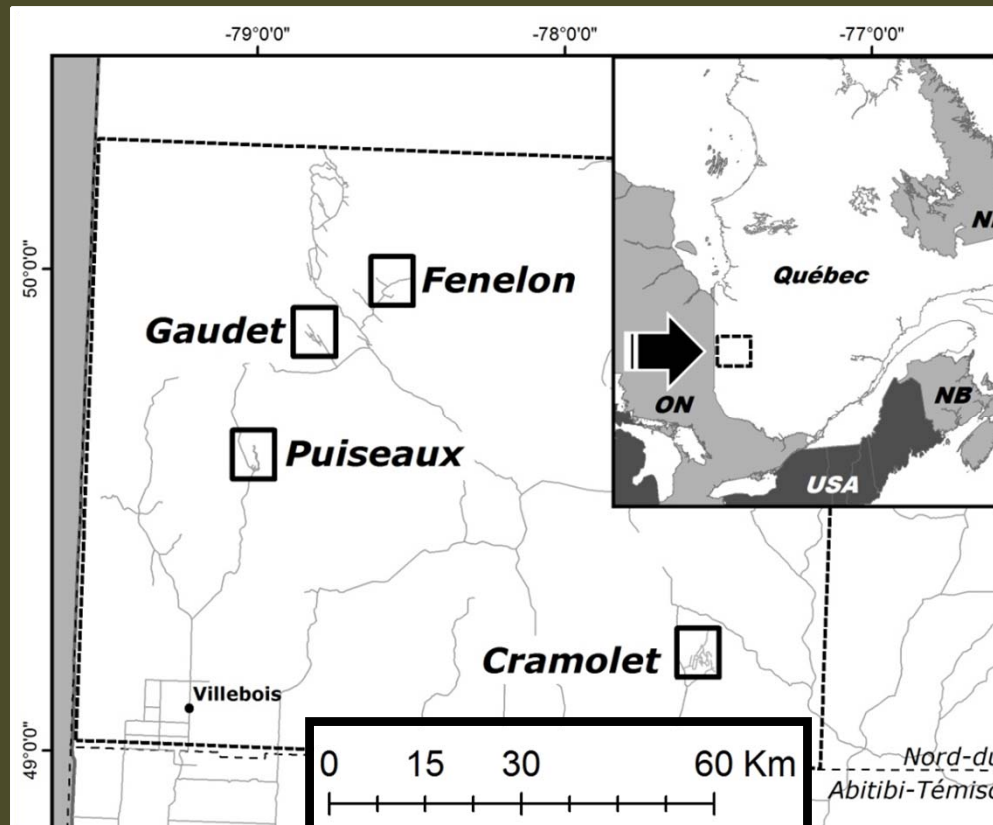
Mixed effects models (Poisson)

- R (AICcmodavg, lme4)
- 8 Candidate models
- Year and Julian Day as fixed effects (temporal)
- Site as random effects (spatial)

Methodology

Random effects: site

- Home range scale: **Block/Grid/Sub-grid**
- Stand scale: **Block/Grid**



Methodology

Diff. tree BA → similar effects of CWD?



Results

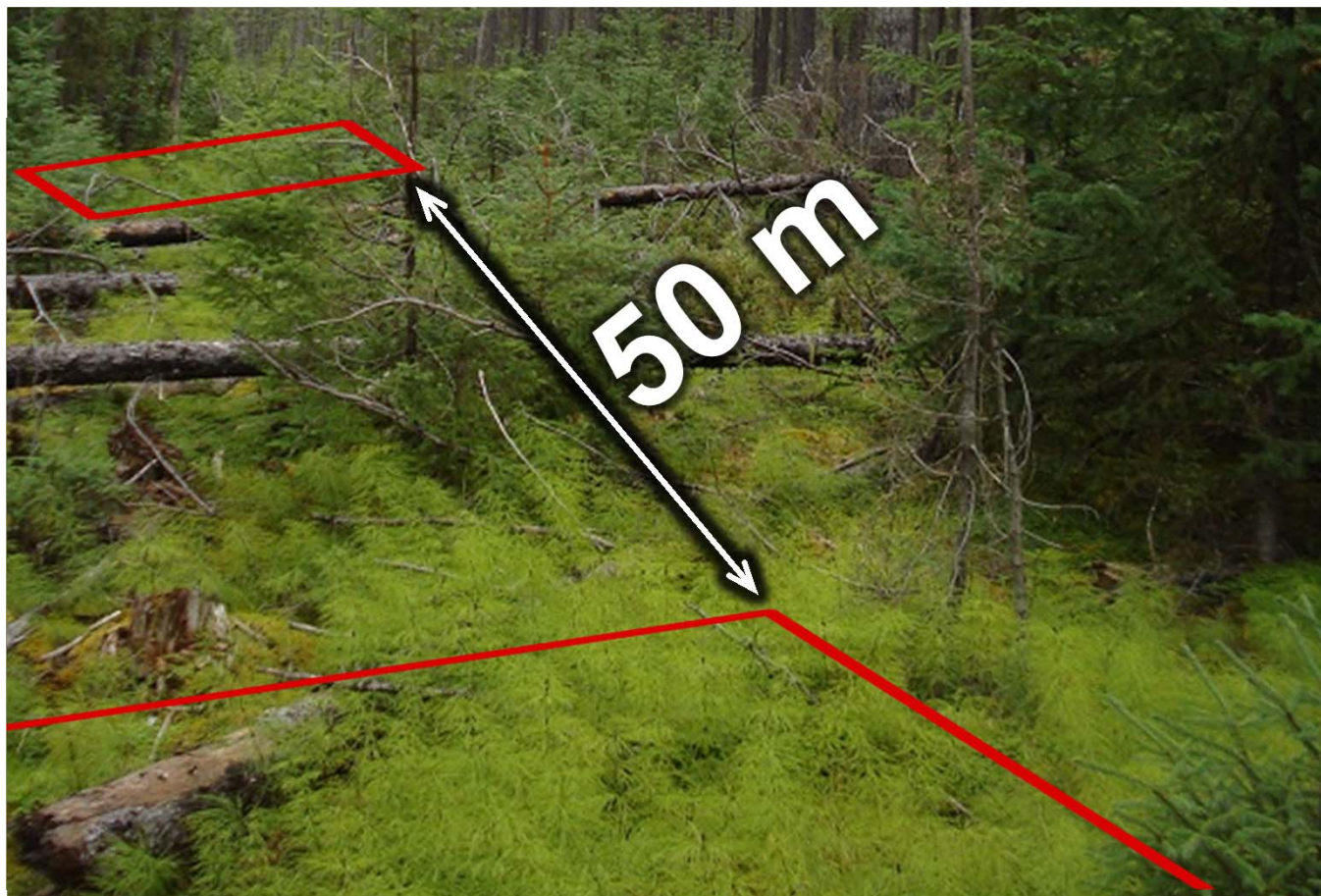
Results

5 sampled species

- Southern red-backed vole (*Myodes gapperi*)
- Meadow vole (*Microtus pennsylvanicus*)
- Southern bog lemming (*Synaptomys cooperi*)
- Deer mouse (*Peromyscus maniculatus*)
- Masked shrew (*Sorex cinereus*)

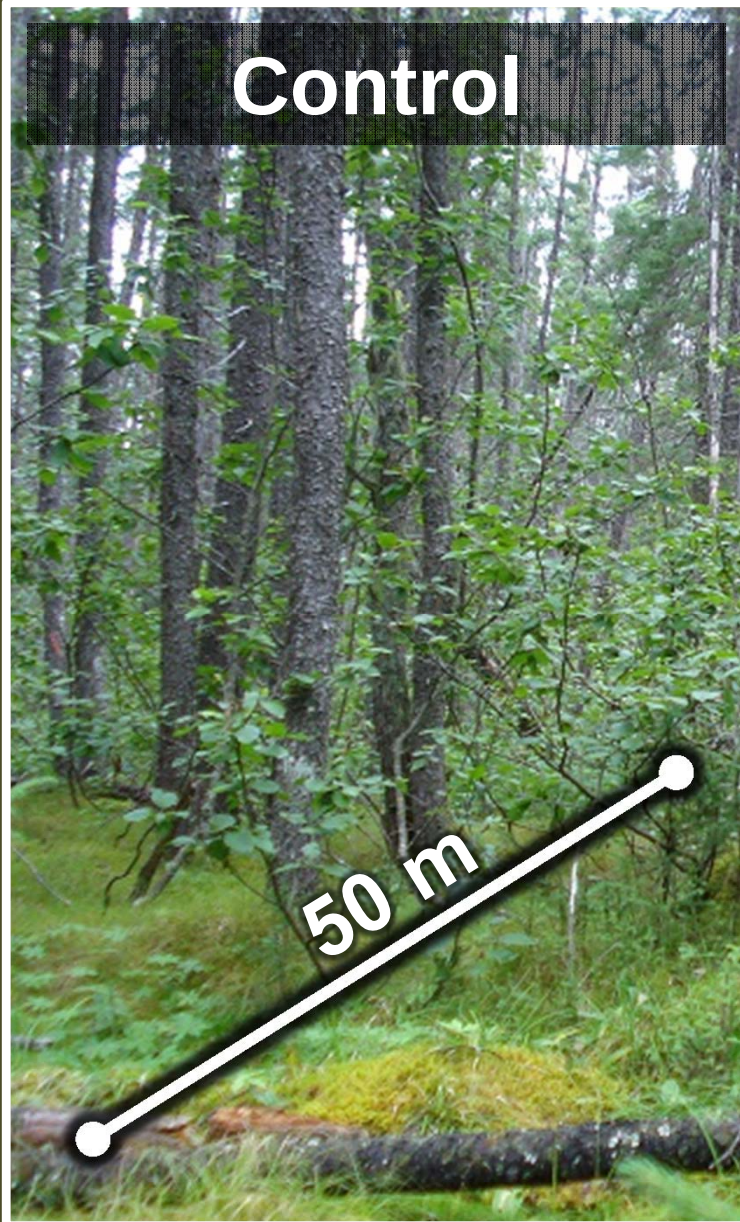
Home range scale

Home range scale effects of CWD



Home range scale

Control



Red-backed vole



Early decay CWD

$$\beta = 0,0018 \pm 0,0007$$

Late decay CWD

$$\beta = 0,0017 \pm 0,0007$$

Deer mouse



Late decay CWD

$$\beta = 0,0053 \pm 0,0020$$

Southern bog lemming

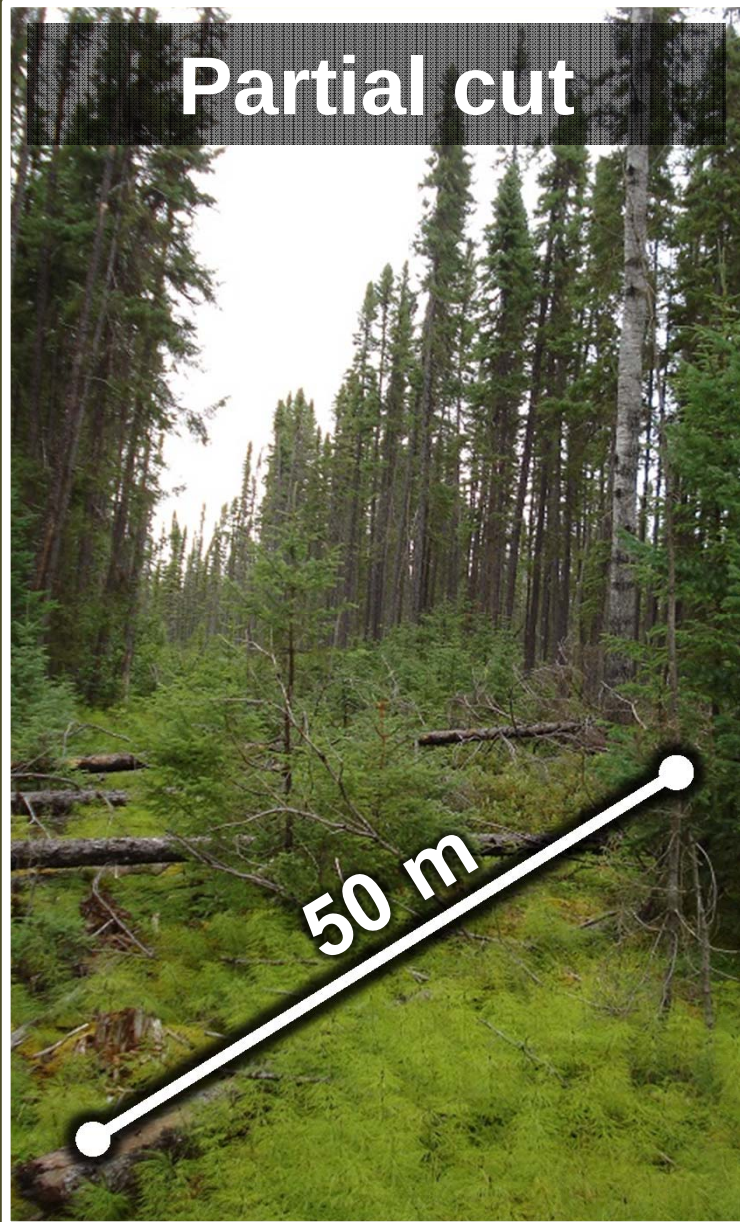


Late decay CWD

$$\beta_{interaction} = -0,0006 \pm 0,0002$$

Home range scale

Partial cut



Red-backed vole



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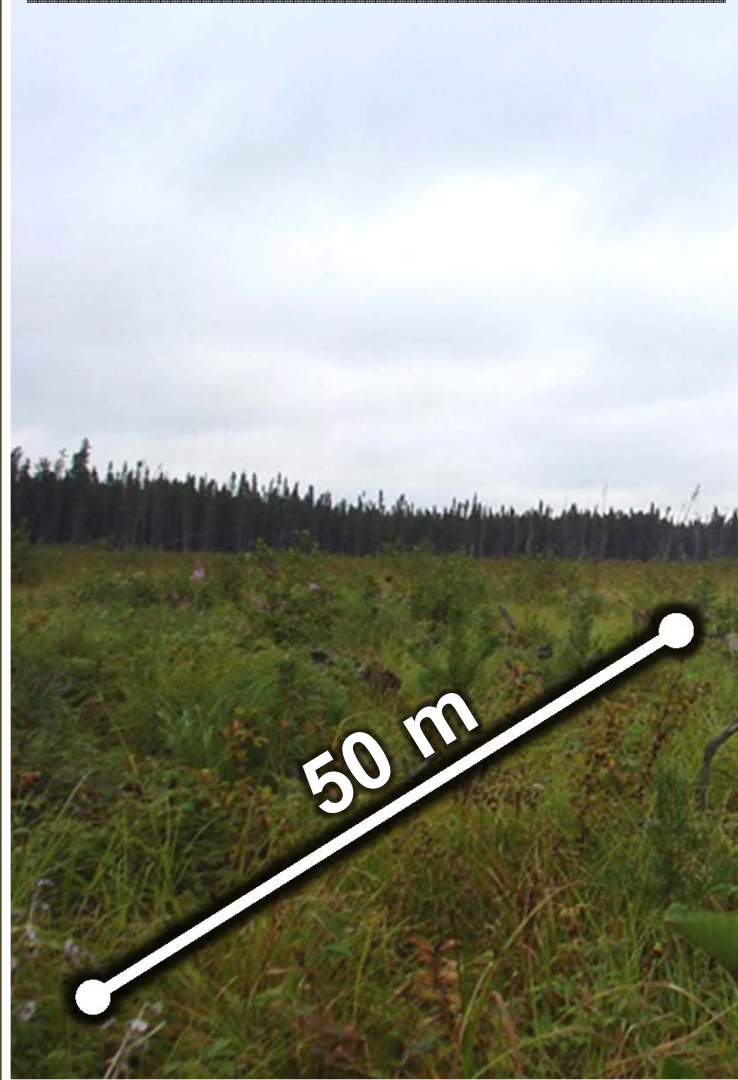


Late decay CWD

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Home range scale

Clearcut



Red-backed vole



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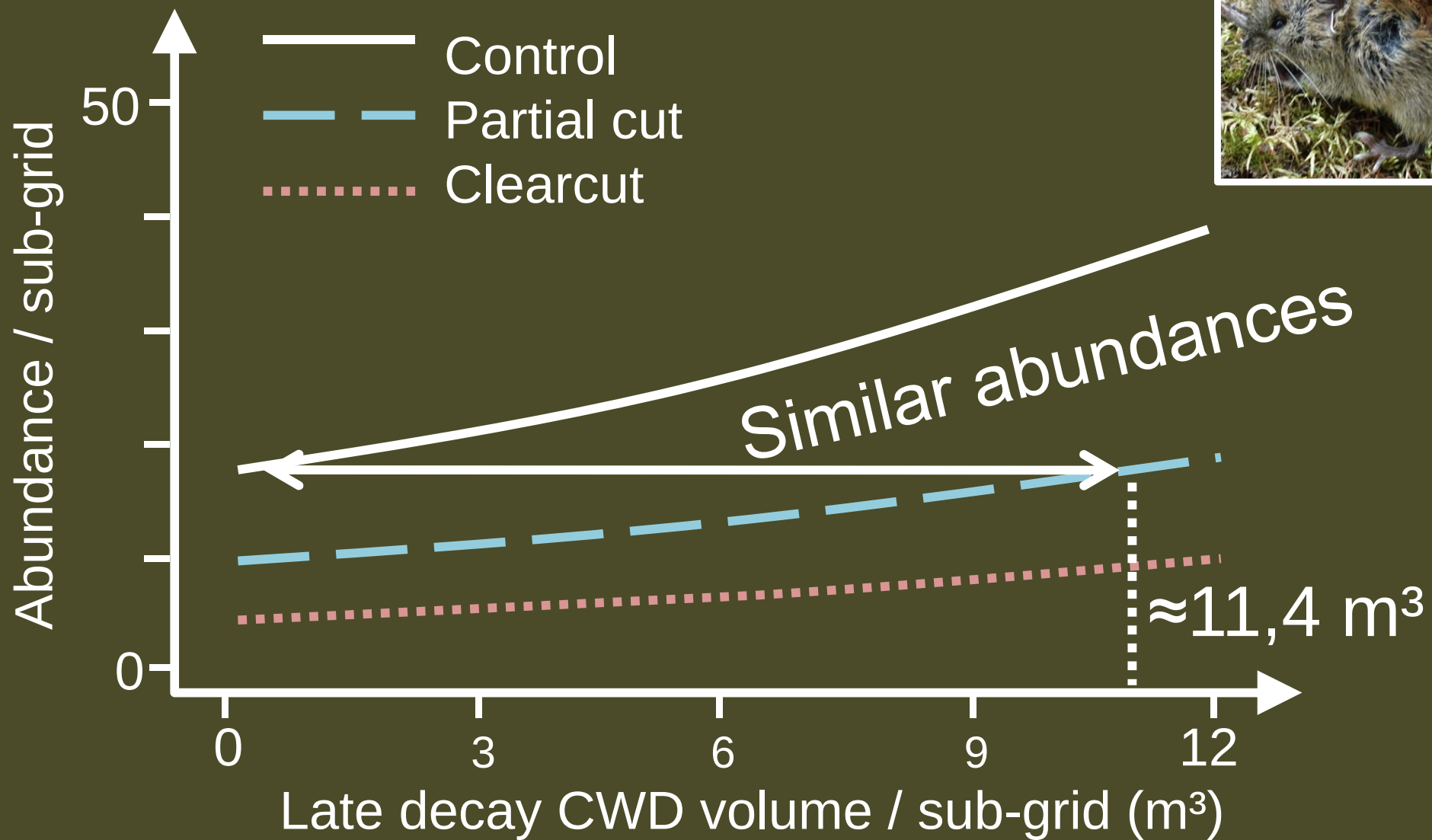


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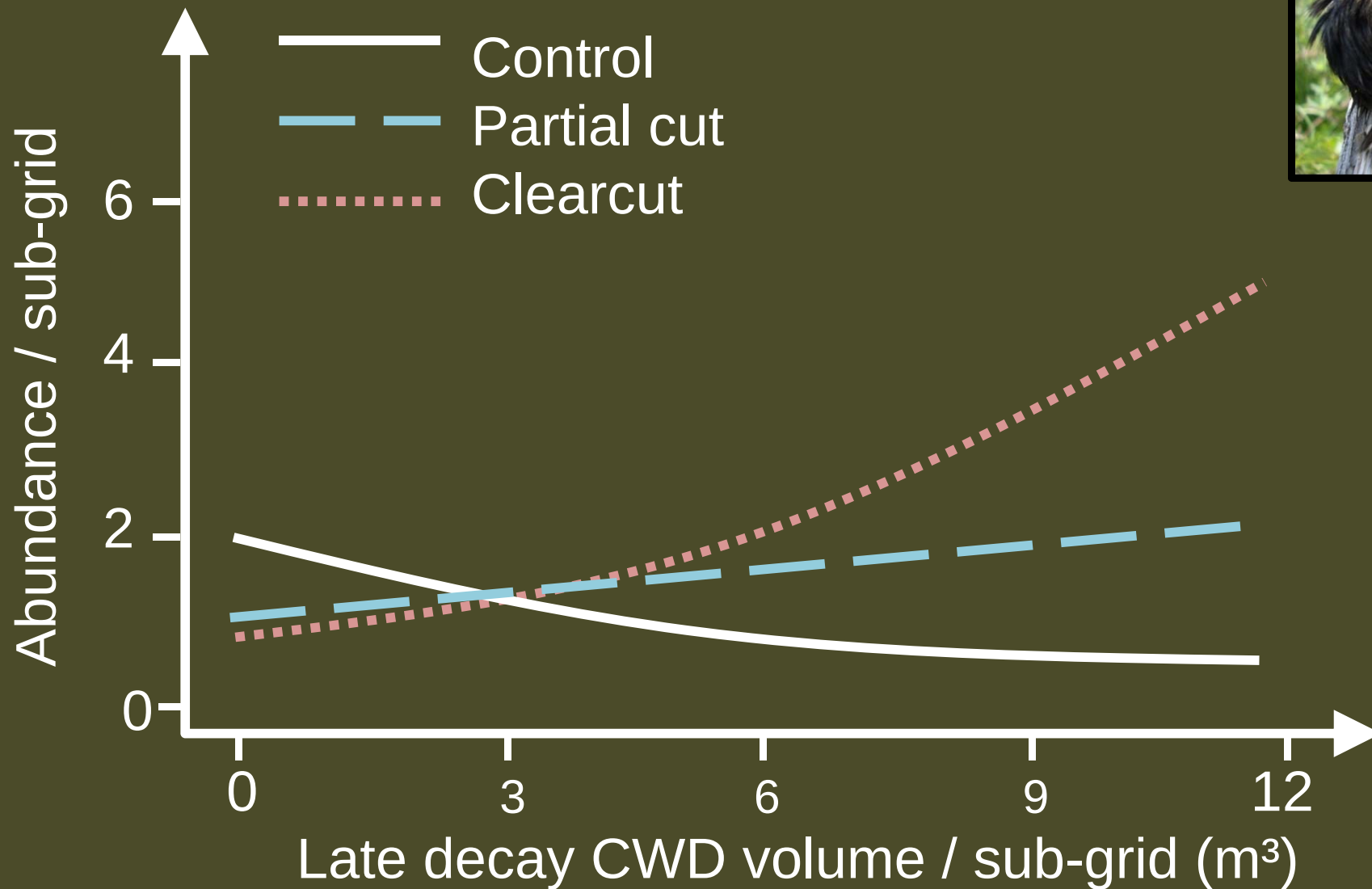
Home range scale

Red-backed vole responses to CWD



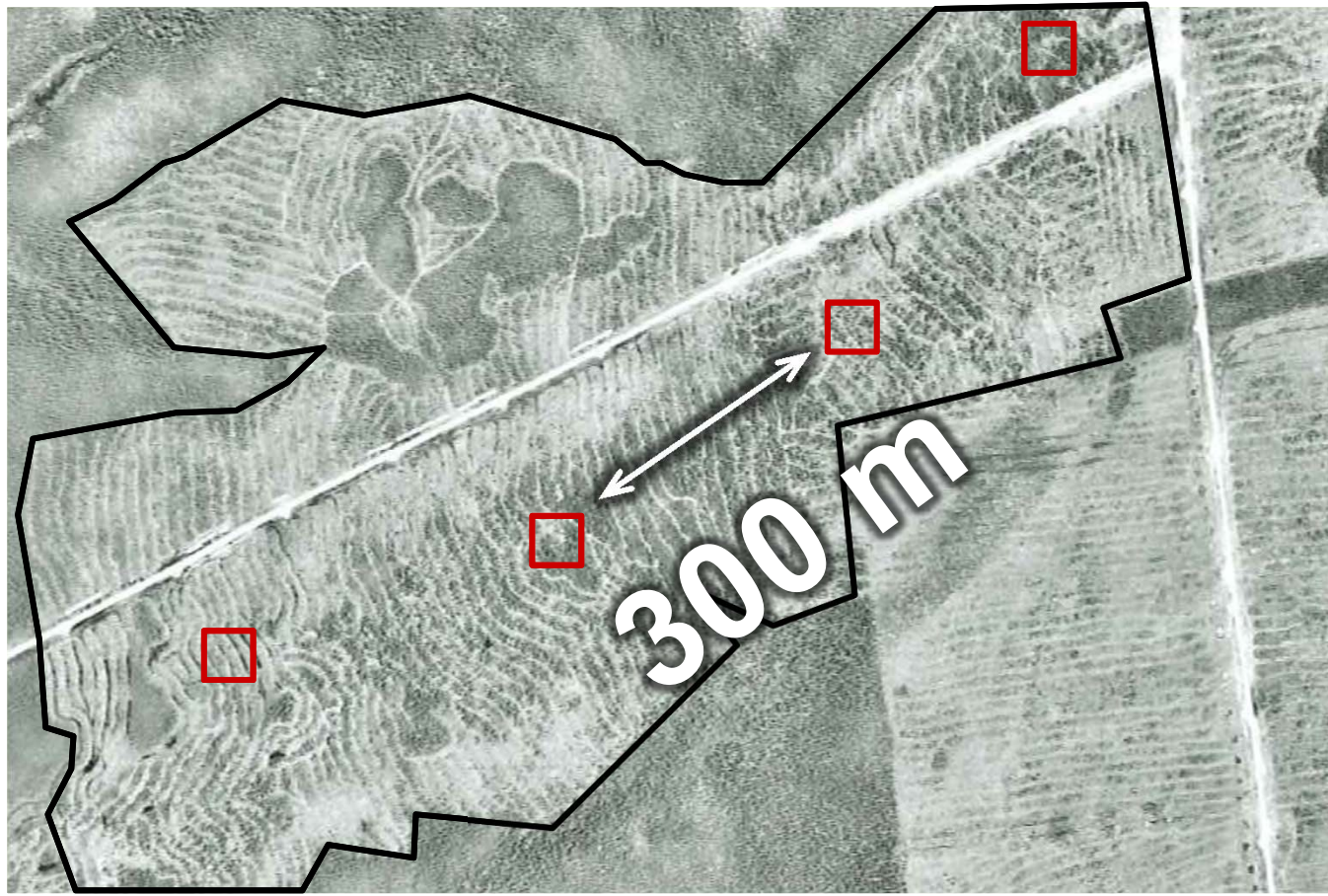
Home range scale

Southern bog lemming responses to CWD



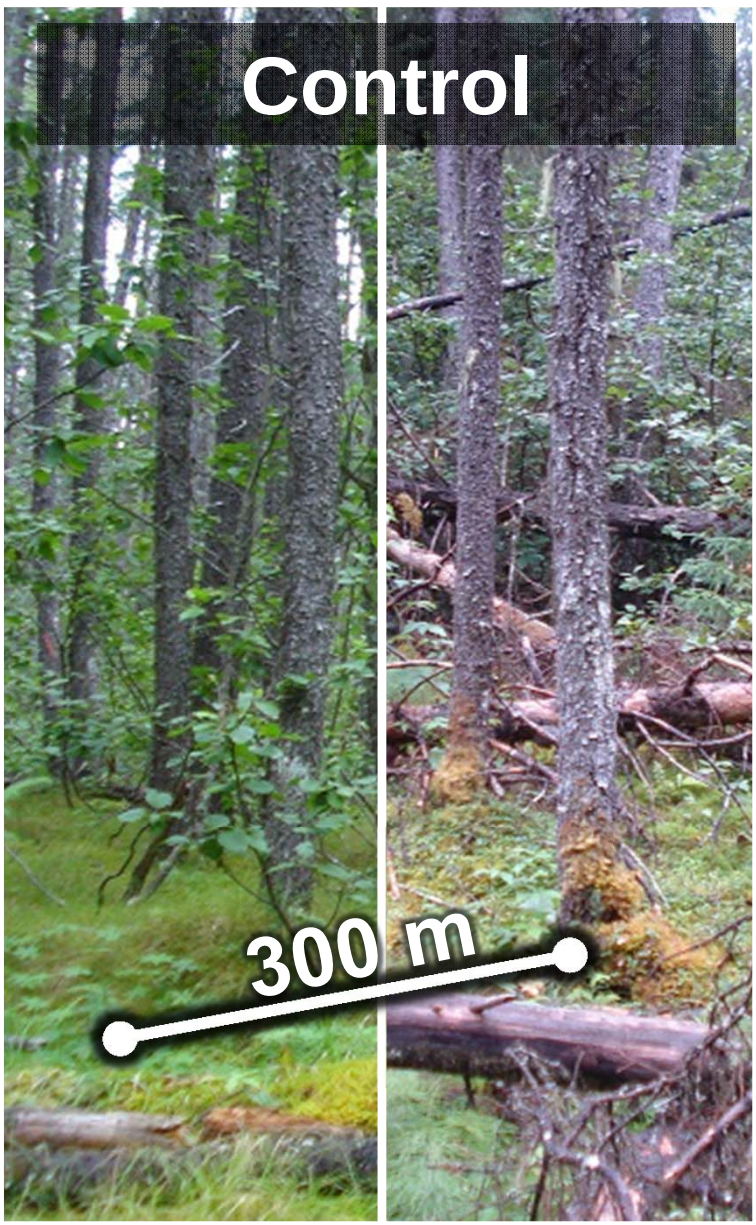
Stand scale

Stand scale effects of CWD



Stand scale

Control



Meadow vole



Early decay CWD

$$\beta = 0,0048 \pm 0,0024$$

Late decay CWD

$$\beta_{interaction} = 0,0005 \pm 0,0003$$

Deer mouse



Late decay CWD

$$\beta = 0,0099 \pm 0,0036$$

Southern bog lemming



Late decay CWD

$$\beta_{interaction} = -0,0007 \pm 0,0003$$

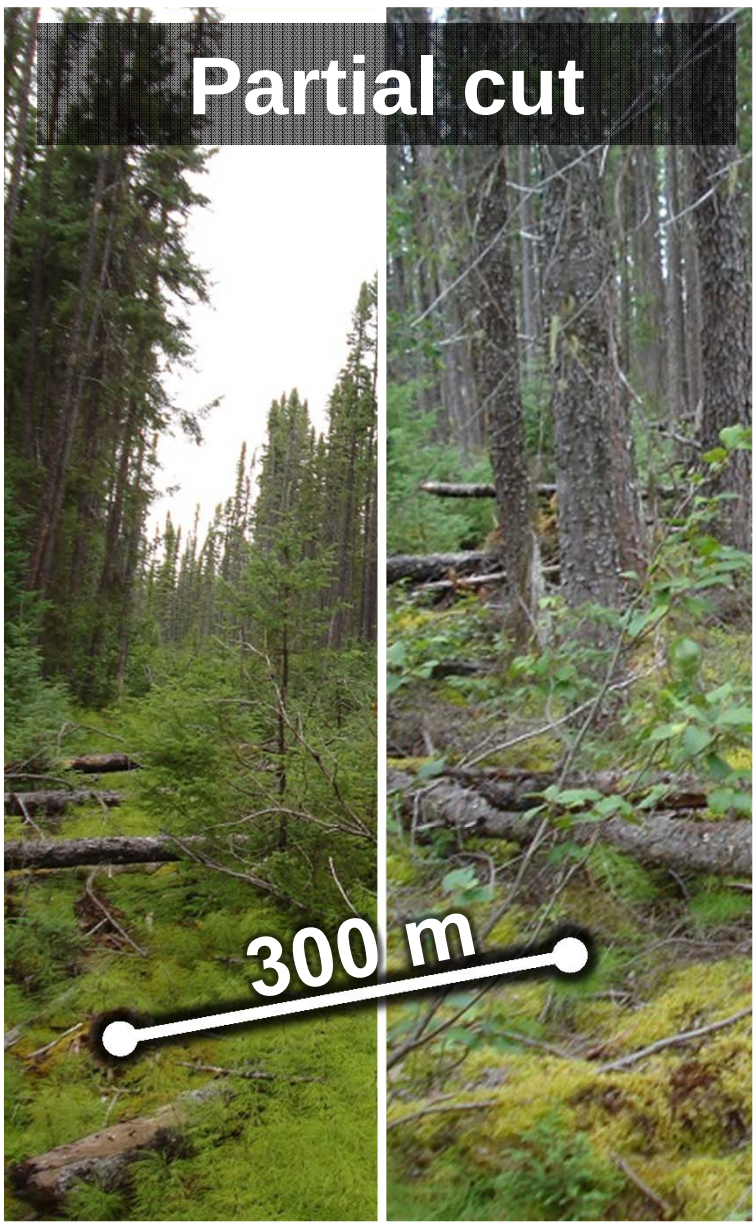
Masked shrew



Late decay CWD

$$\beta_{interaction} = -0,0029 \pm 0,0010$$

Stand scale



Meadow vole



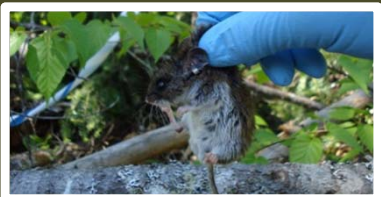
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Stand scale

Clearcut

Meadow vole



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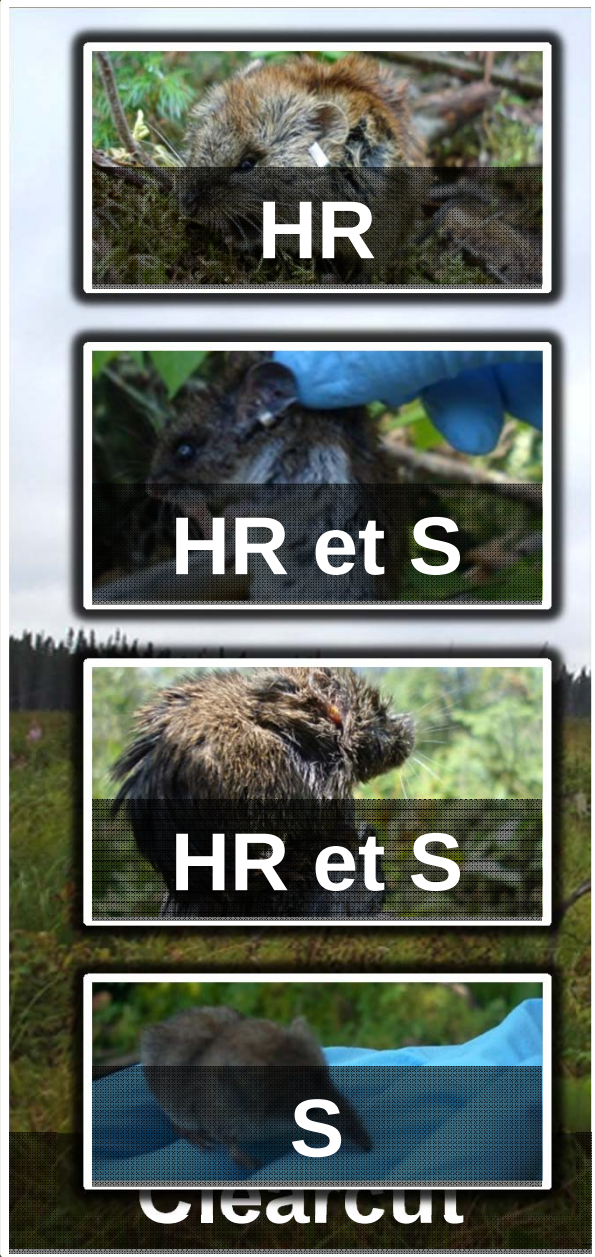


Late decay CWD

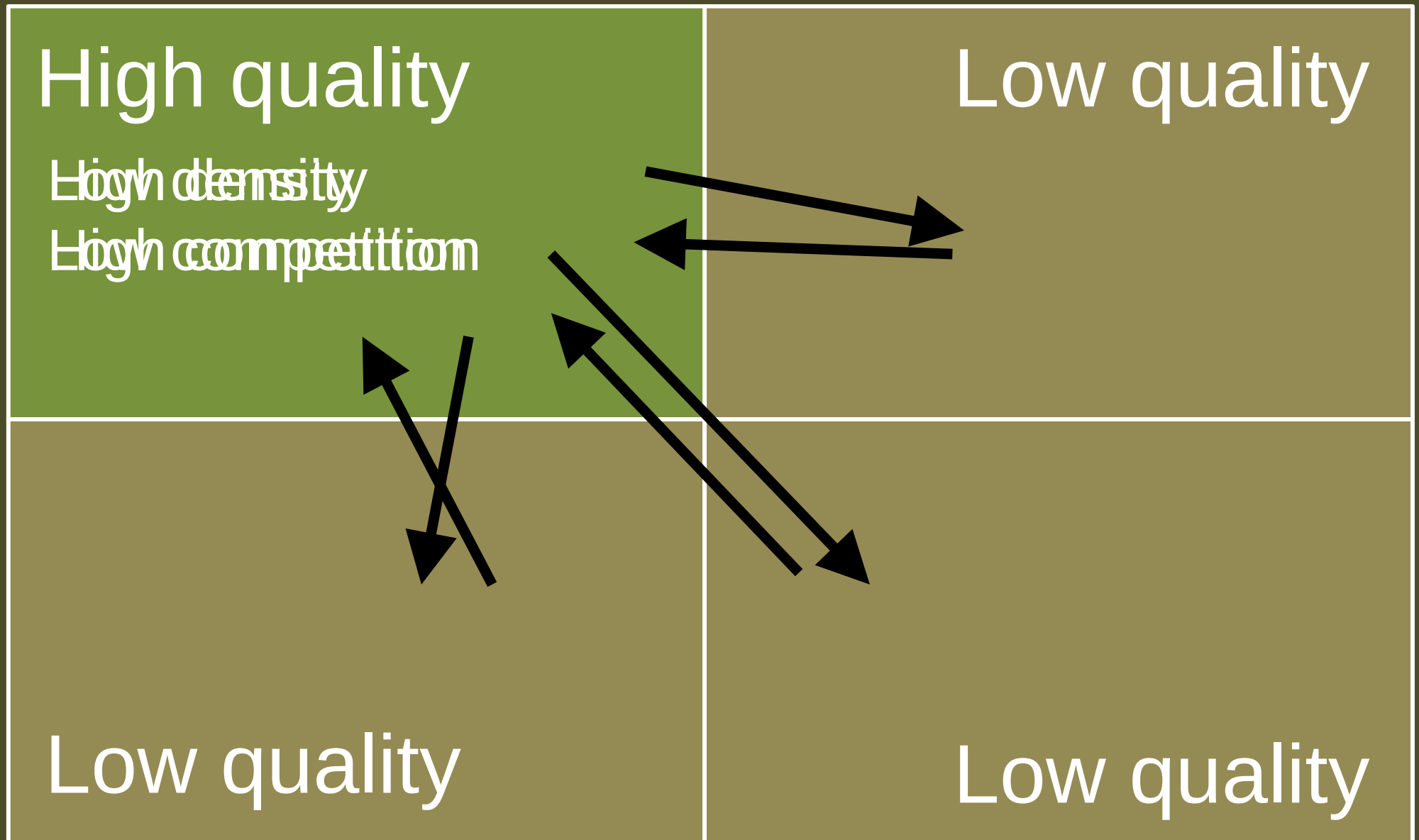
$$\beta_{interaction} = -0,0029 \pm 0,0010$$

300 m

Effects of CWD



Density-dependence



Conclusion

- **Red-backed voles and deer mice responded positively in all treatments**
- **Strong interaction effects (CWD volume and Tree BA) for 3 species**
 - Southern bog lemmings, masked shrews (pos. response in clearcuts)
 - Meadow voles (pos. response in controls)

CWD as a mitigating factor

Lack of consistency between studies

Effects of tree removal

— : Fuller et al. (2004), Sullivan *et al.* (2008)

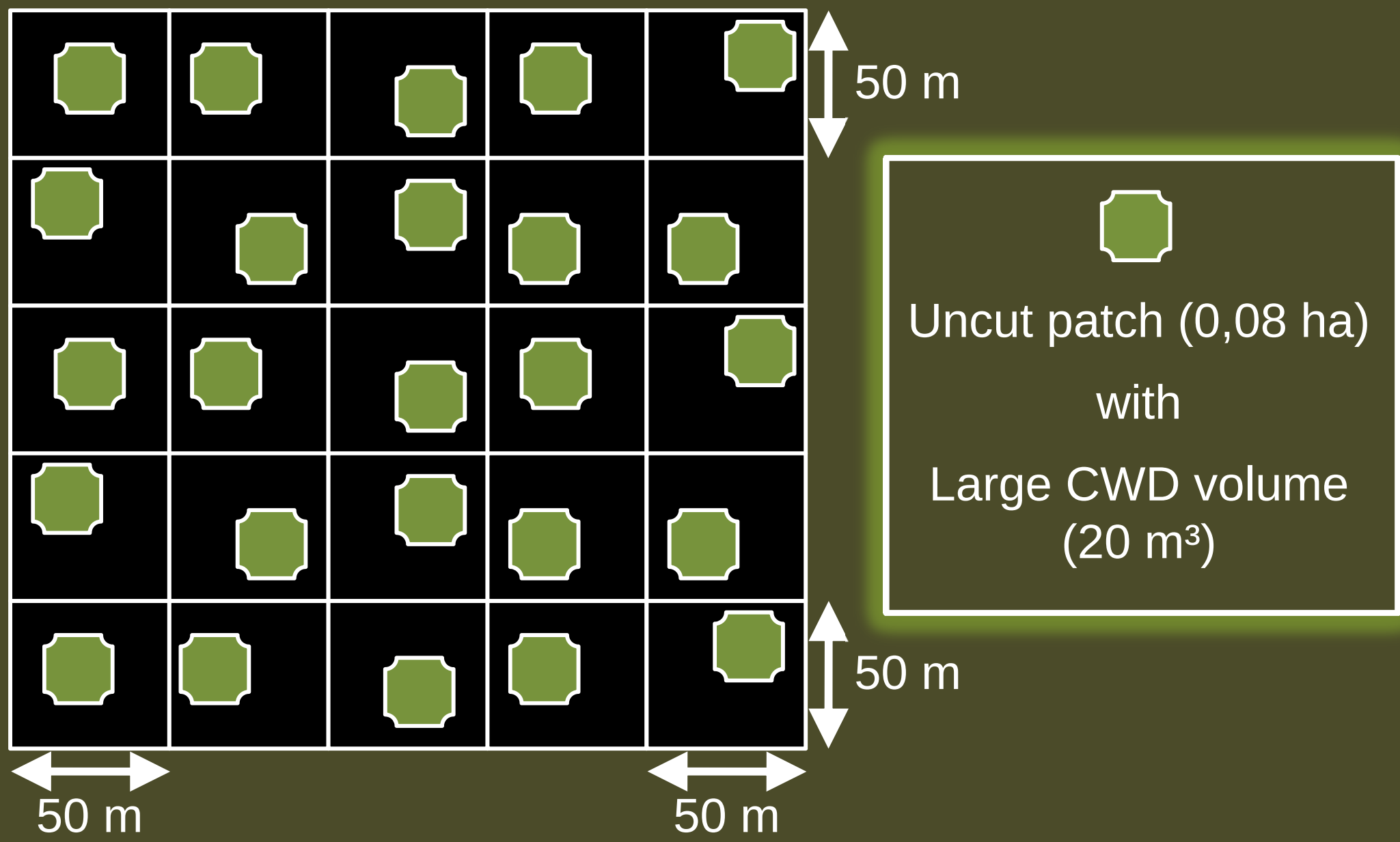
≈ : Steventon *et al.* 1998, Gitzen *et al.* 2007

+ : Kirkland (1990), Kaminski *et al.* (2007)

- We confirm: CWD works as a mitigating factor!



Management Implications



Thank you!

Danielle Charron

Caroline Trudeau

Florence Boucher-Boisclair

Raynald Julien

Annie Desrochers

Guillaume Brochu

Marie-Hélène Longpré

Line Blackburn

Abdoul-Ousmane Dia

Marie-Ève Sigouin

Hervé Bescond

Geneviève Duchesne

Ahmed Laamrani

Julie Arseneault

Raëd Elferjani

Jonathan Gagnon

Pierre Fauteux

Akira Yasuda

Marion Ségué

Anys Duchesne

and all of you!



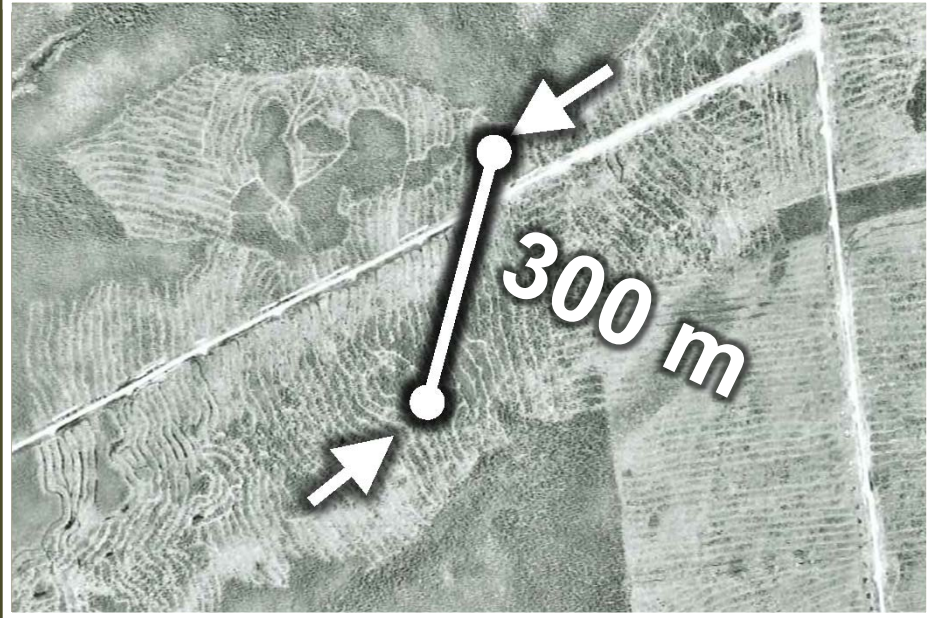
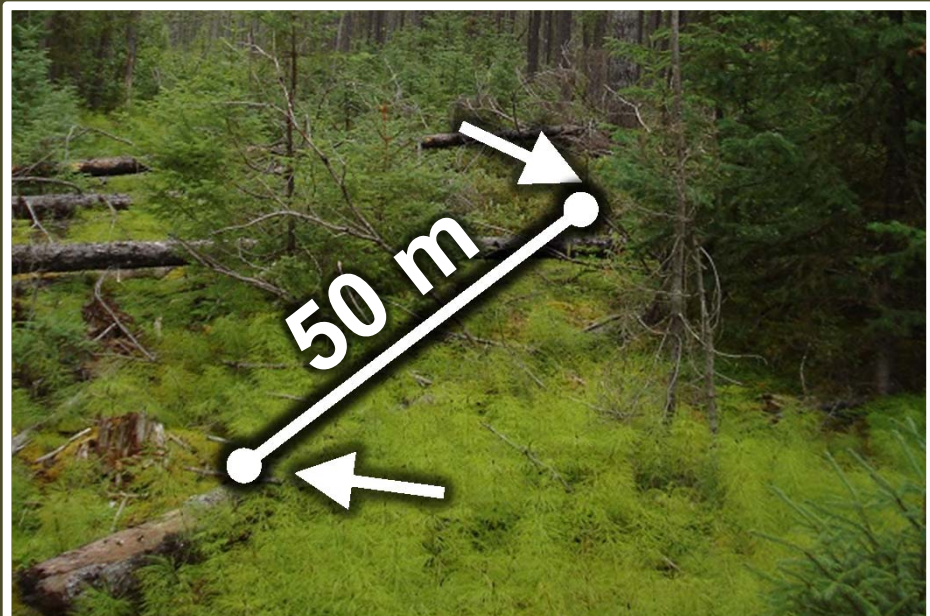
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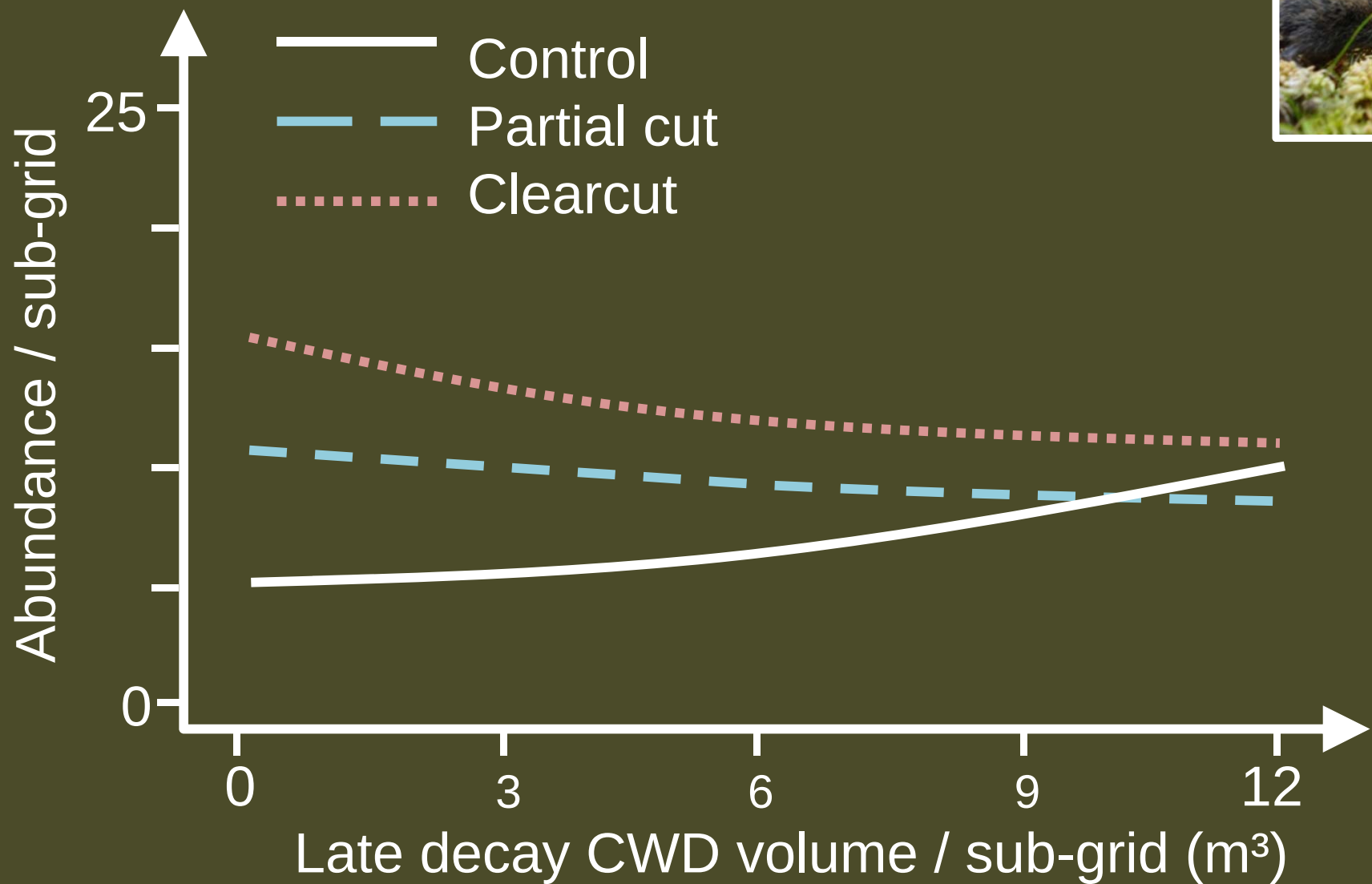


Thank you!



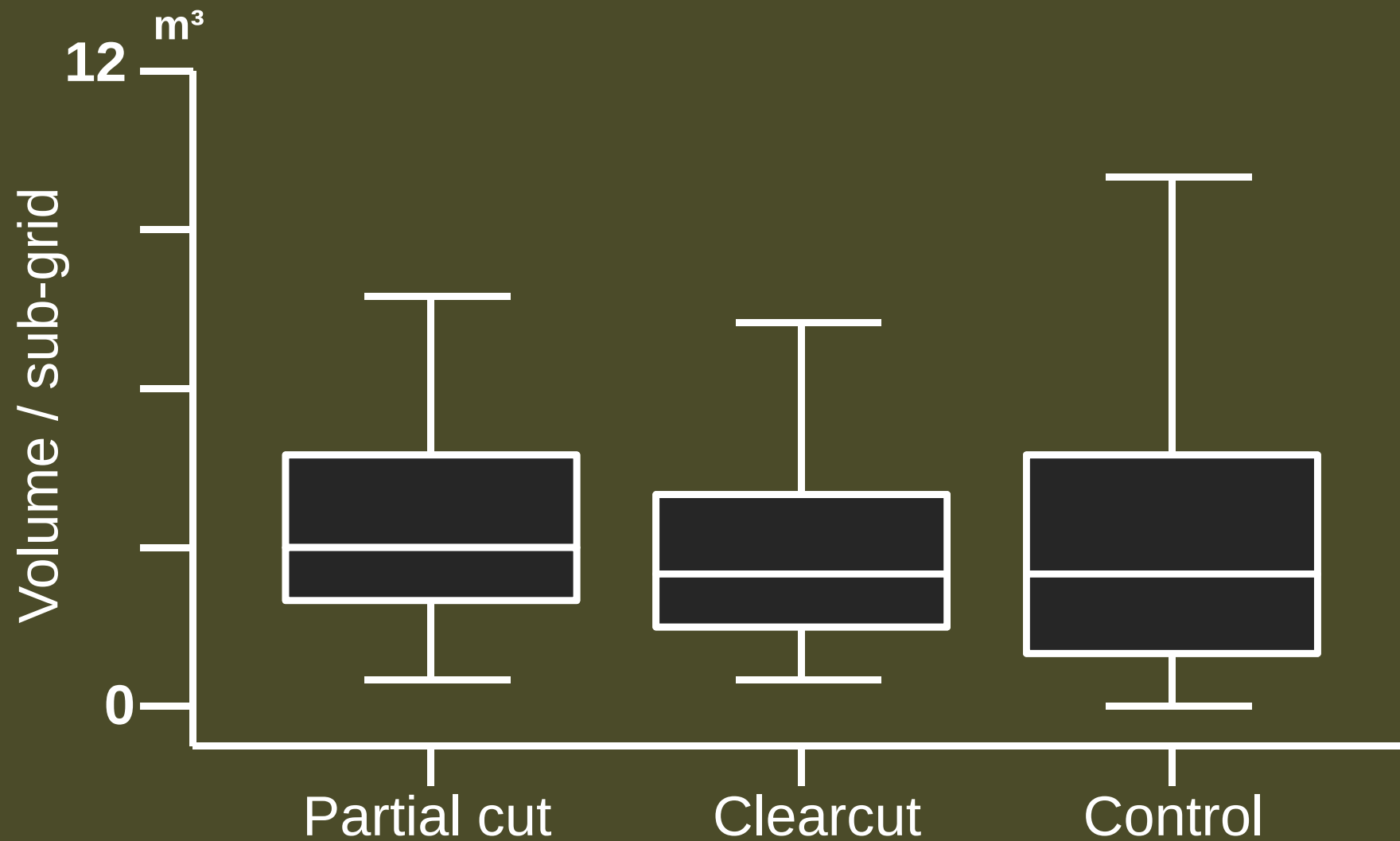
Stand scale

Meadow vole responses to CWD



CWD volumes

Early decay CWD volume / sub-grid (0,03 ha)



CWD volumes

Late decay CWD volume / sub-grid (0,03 ha)

