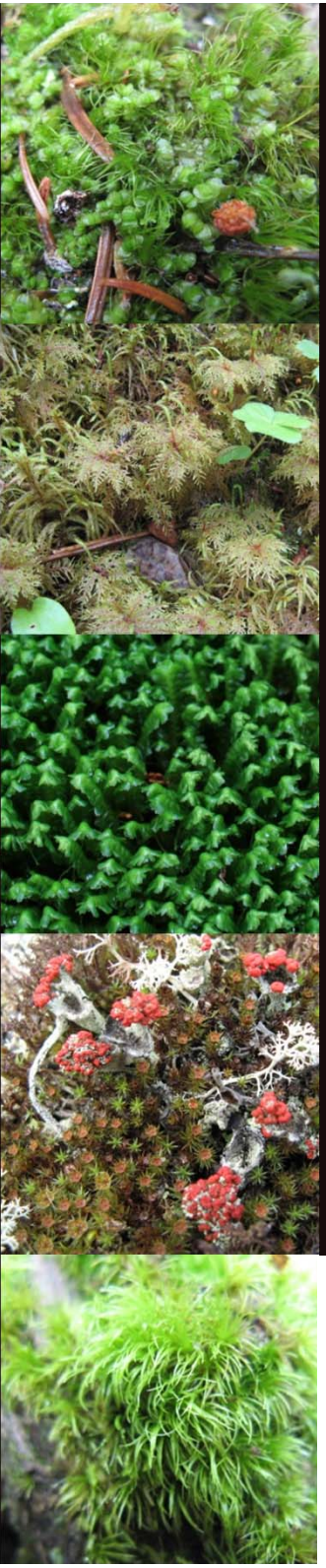


Diversity of bryophytes in relation to coarse woody debris: does it differ between a post-fire and a post-clearcut chronosequence?

Myriam Paquette

Master student, Biology, UQAT

Under the direction of :

Yves Bergeron

And the codirection of :

David Pothier and Nicole Fenton

Symposium on deadwood dynamics, Rouyn-Noranda

May 15-19, 2011

Université du Québec en Abitibi-Témiscamingue

Université Laval

Chaire de recherche industrielle CRSNG - Université Laval en sylviculture et faune

Chaire industrielle CRSNG - UQAT - UQAM en aménagement forestier durable

Fonds de recherche sur la nature et les technologies Québec

Bryophytes

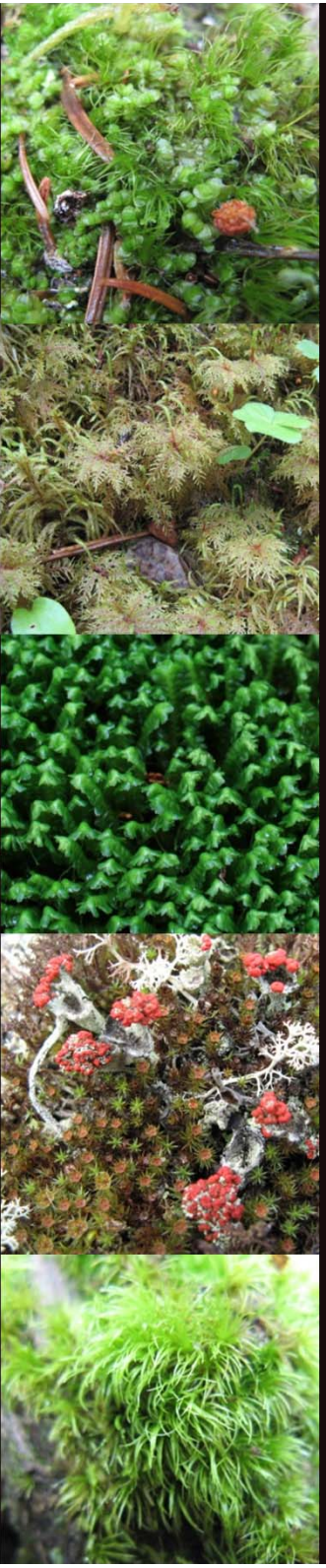
- Mosses

Bryophytes

- Liverworts

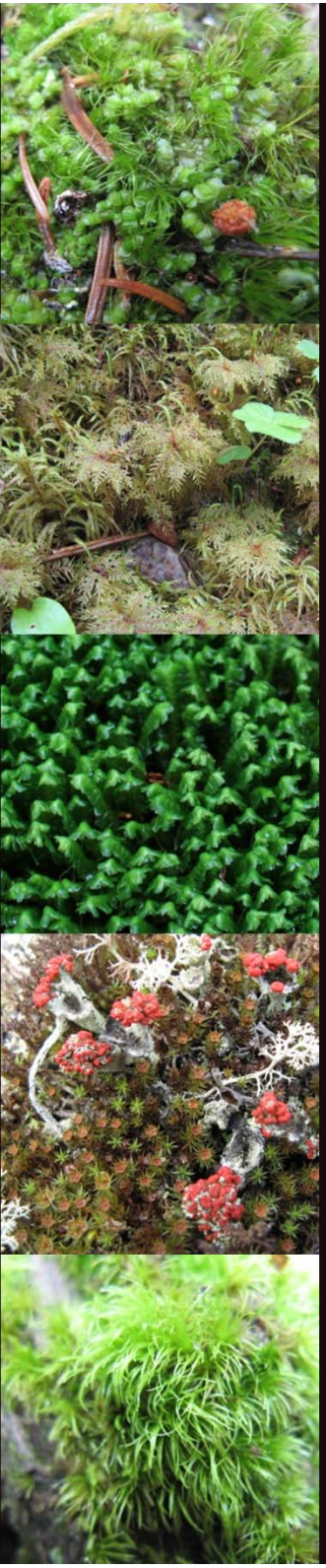
Mylia taylorii

Bazzania trilobata



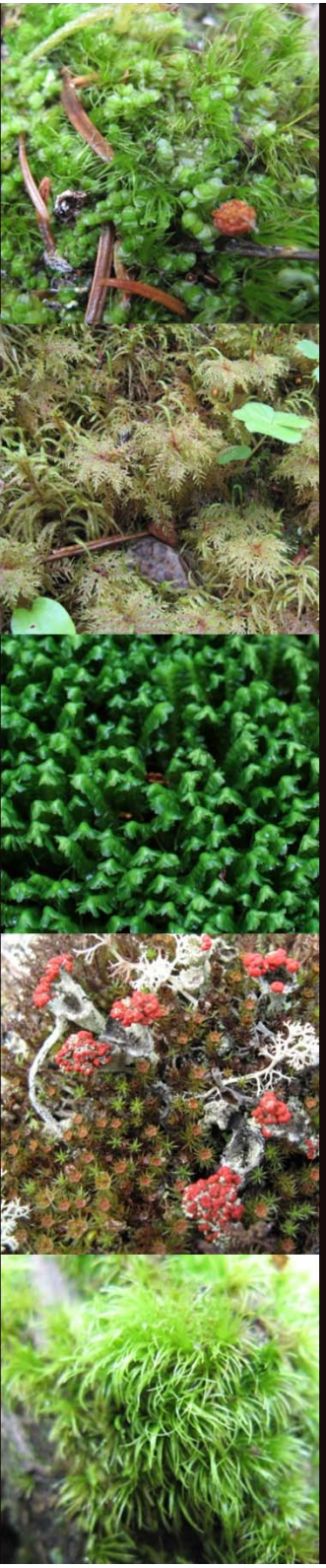
Bryophytes

- Mosses and liverworts
- Important role in water and nutrients cycle
- Biomass



Wildfires vs clearcuts

- Soil and vegetation disturbance
- DEAD WOOD
  - Epixylic bryophytes
  - Substrate
  - Microhabitats



Objectives and hypotheses

Objectives

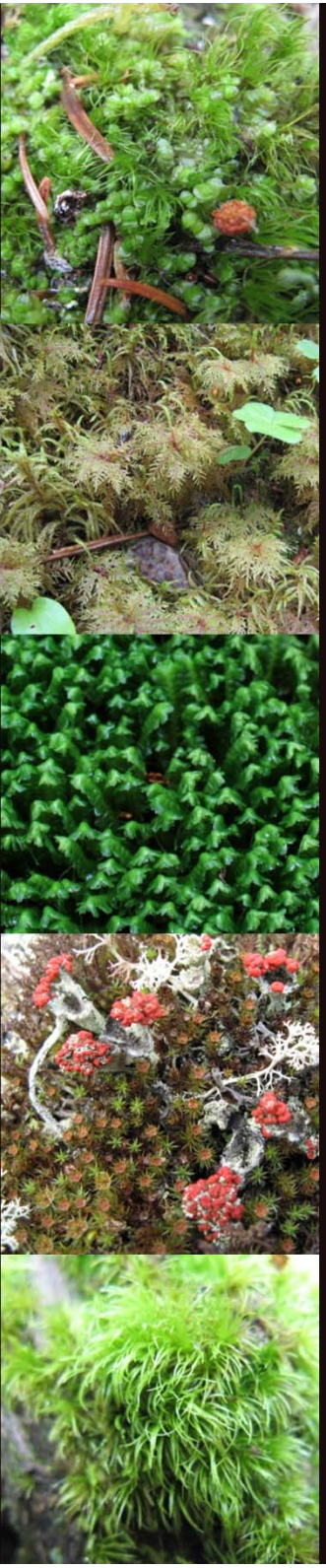
1. Determine the relationship between bryophytes diversity and dead wood

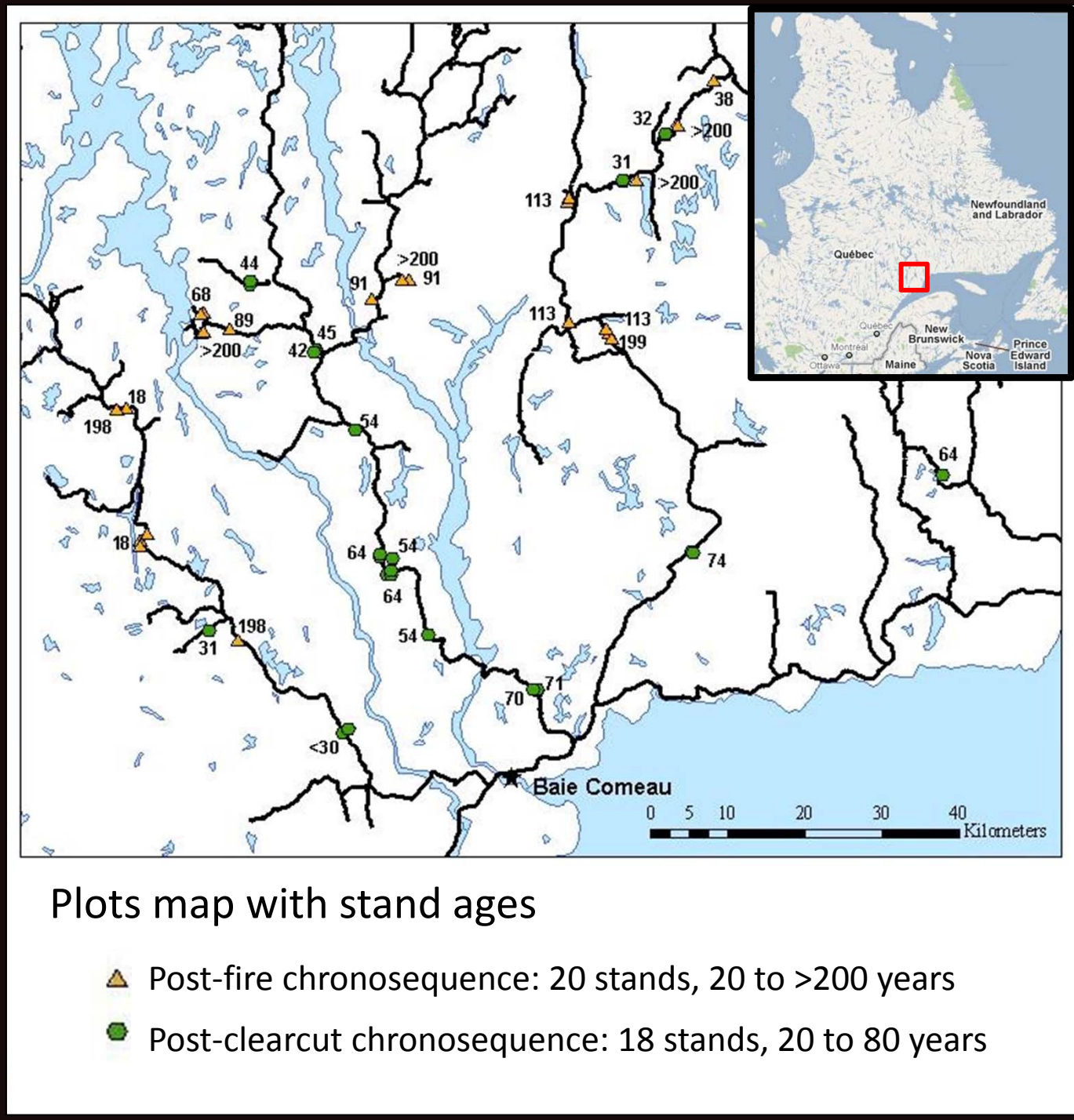
Hypotheses

1. Higher bryophytes richness when CWD volume is high.
   - Decay classes 3-4
2. Other types of dead wood are as important as CWD

- Multiple comparisons (Tukey)
- Linear regressions

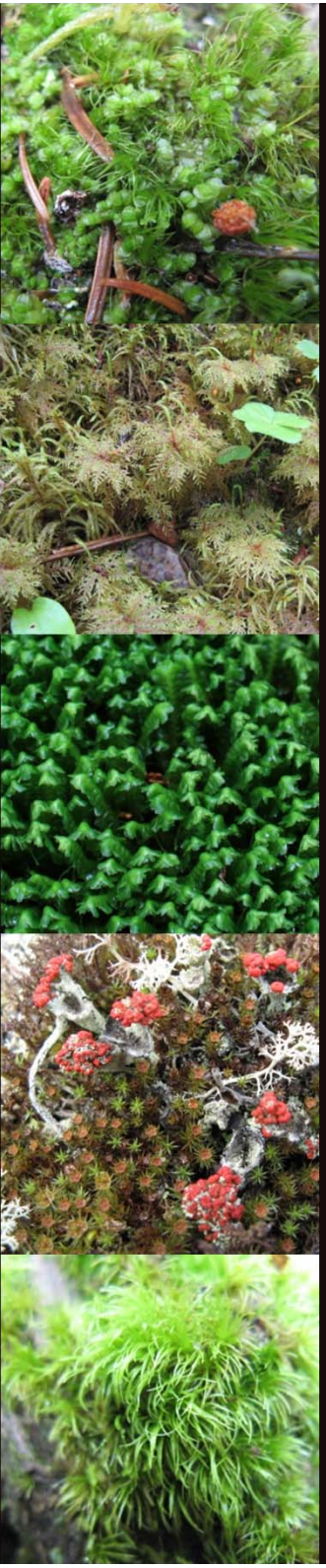
Alpha level : 0.05





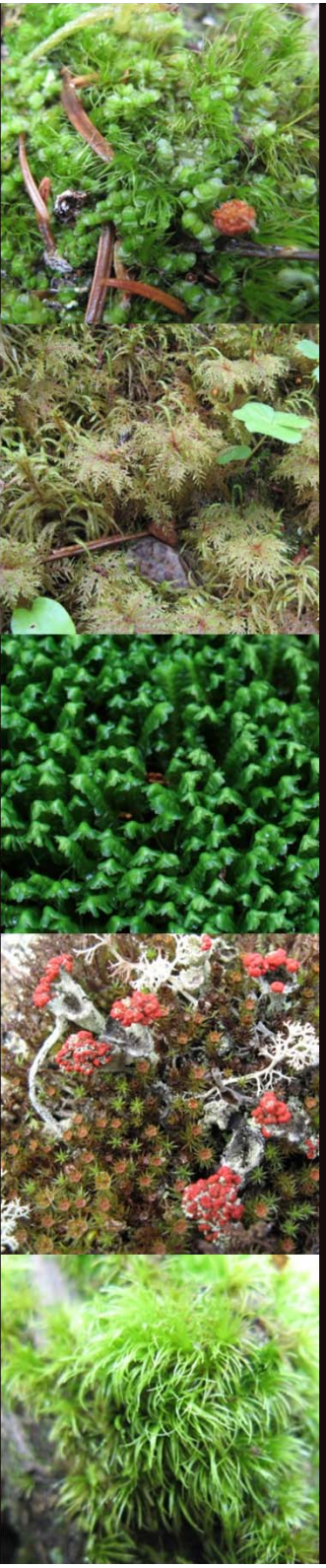
Plots map with stand ages

- Post-fire chronosequence: 20 stands, 20 to >200 years
- Post-clearcut chronosequence: 18 stands, 20 to 80 years



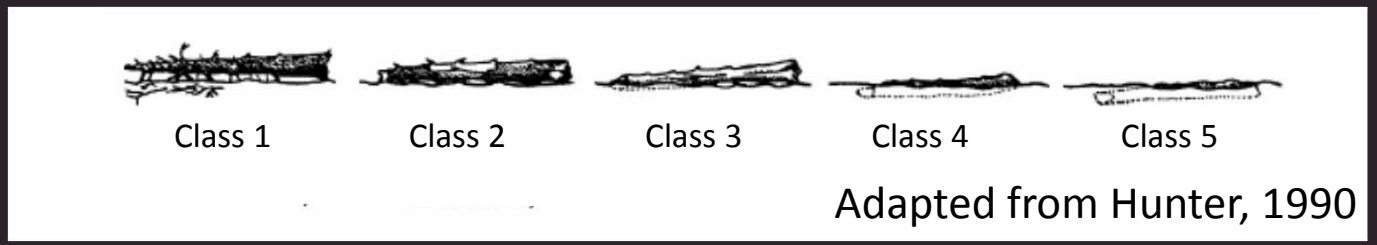
Regional characteristics

- Long fire cycle
  - High proportion of old growth forests
  - Secondary disturbances

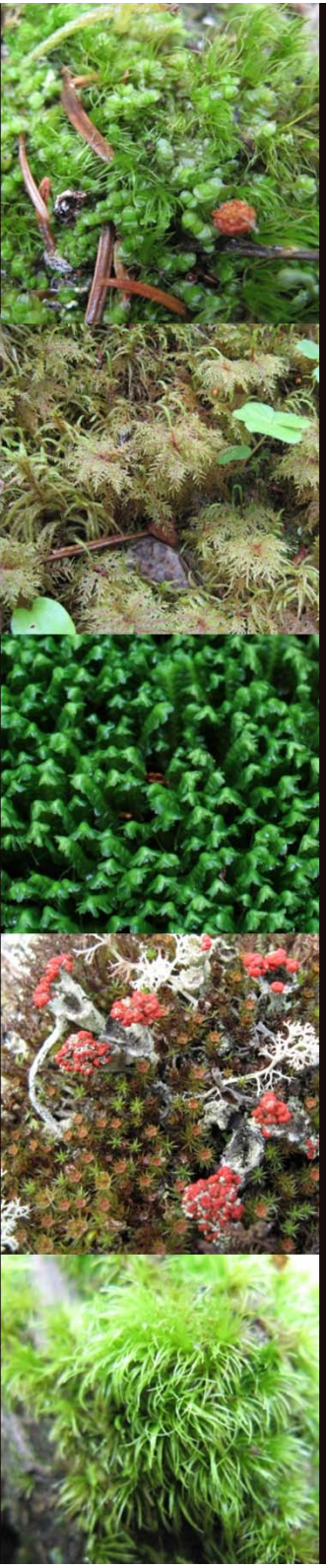


Methodology

- Circular plot (400 m^2)
  - Edaphic conditions
  - All coarse woody debris (>9 cm) within 400 m^2 and decay classes

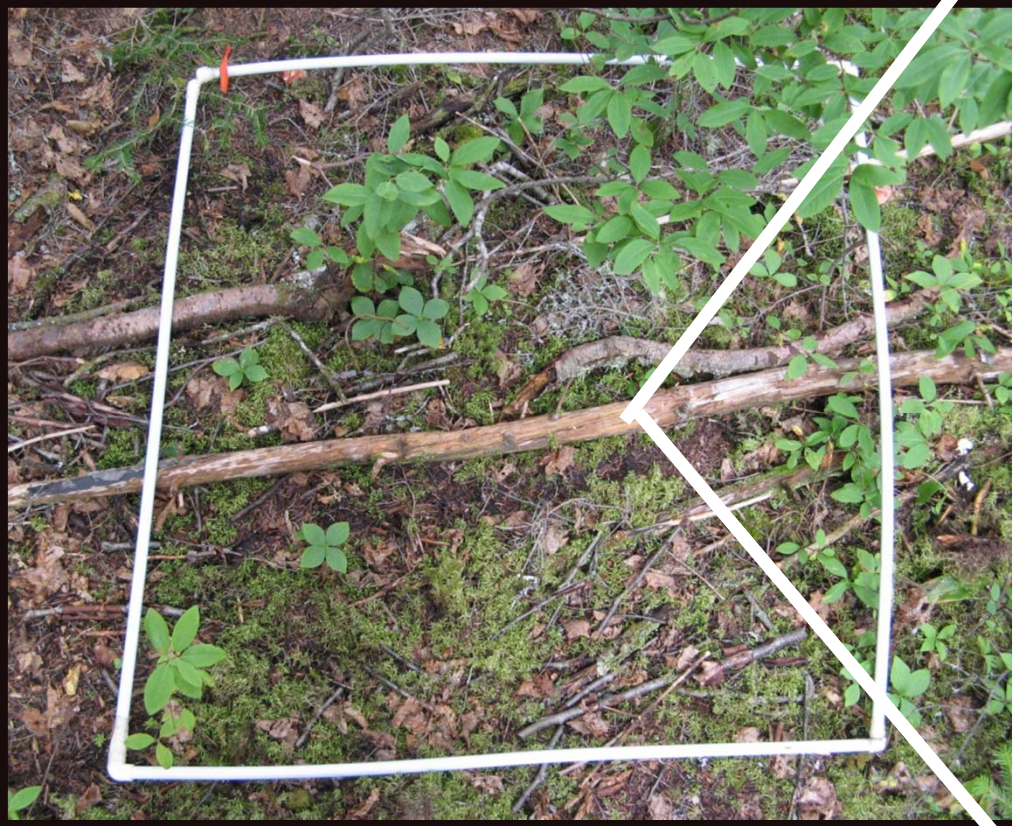


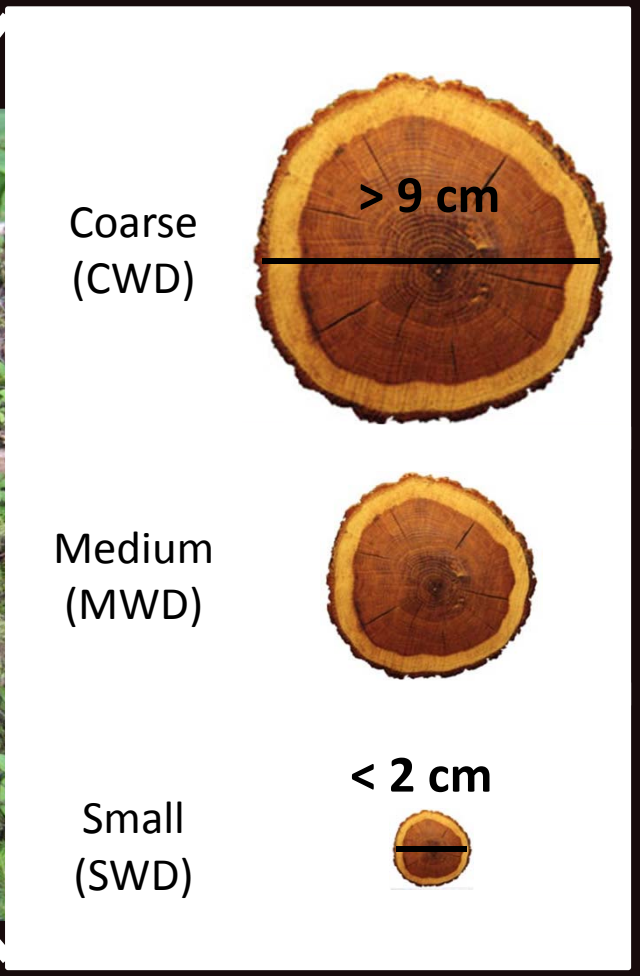
Adapted from Hunter, 1990



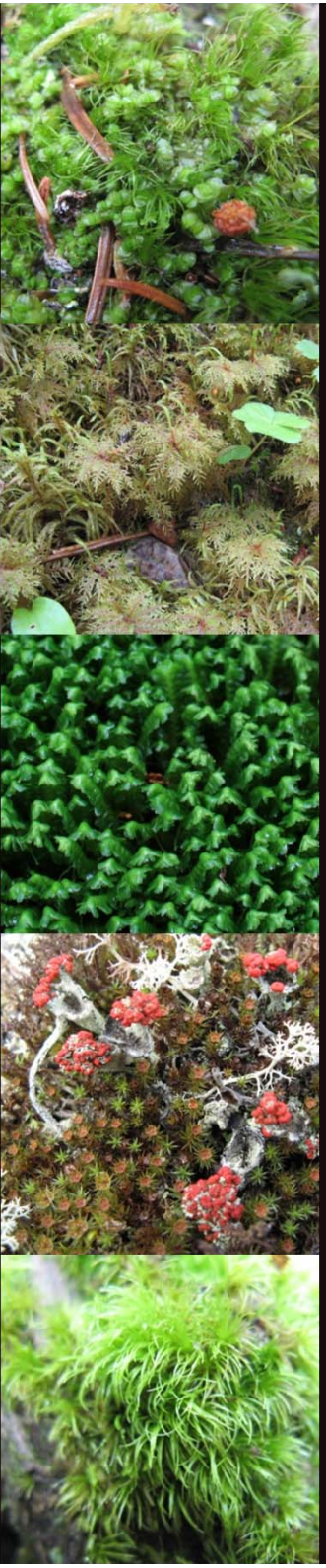
Methodology

- 20 sub-plots (1 m^2)
  - Bryophytes and substrates
  - Percent cover





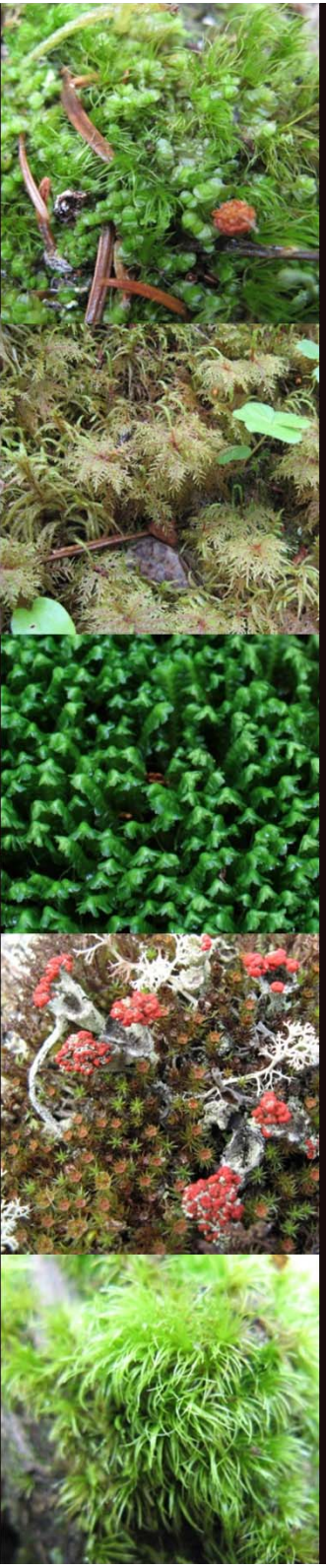
Results



Species richness

	Clearcuts	Wildfires		
	20-80 (18 stands)	20-100 (11 stands)		
Mosses				
Liverworts				
Total				

Mean species number by stand ± SE



Species richness

	Clearcuts	Wildfires		
	20-80 (18 stands)	20-100 (11 stands)		
Mosses	21.3 ± 1.2 *a*	22.5 ± 2.0 *a*		
Liverworts				
Total				

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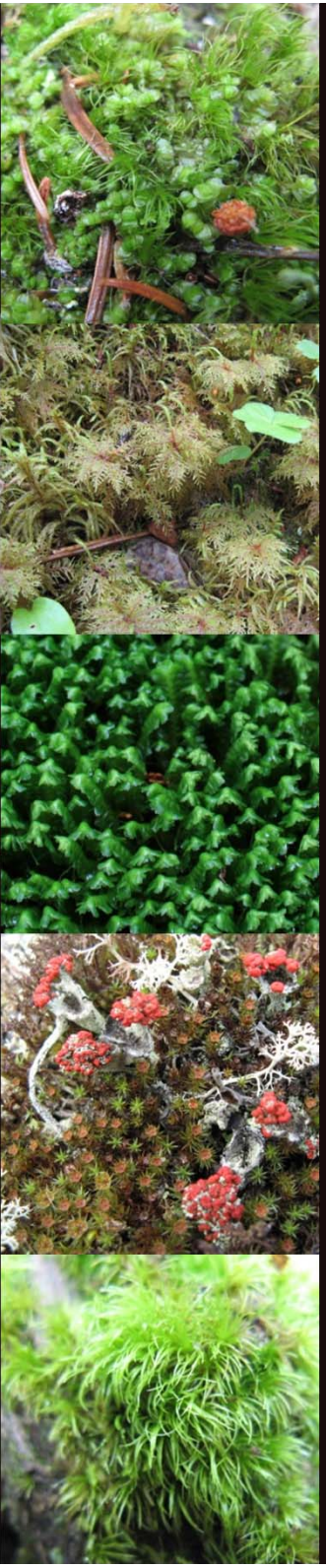

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Liverworts	12.4 ± 0.9 *a*	13.2 ± 1.2 *ab*		
Total				

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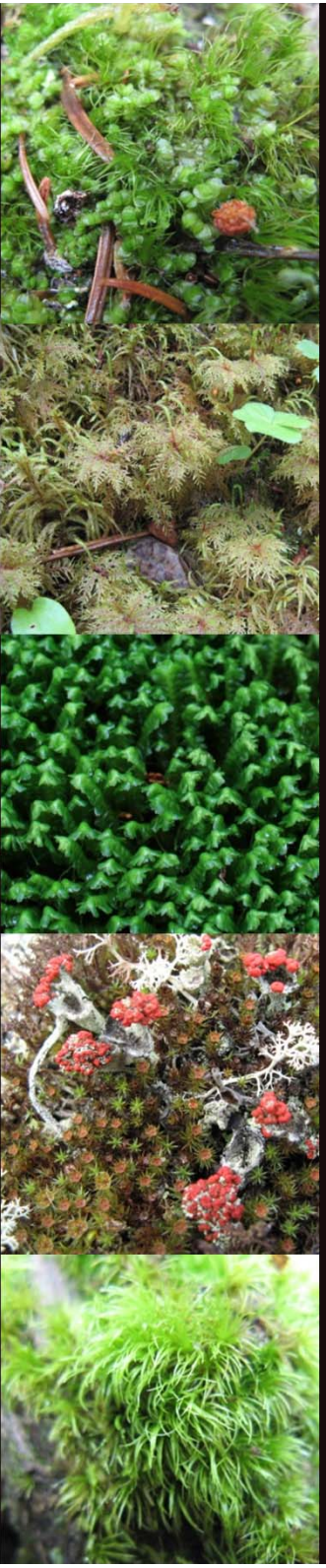

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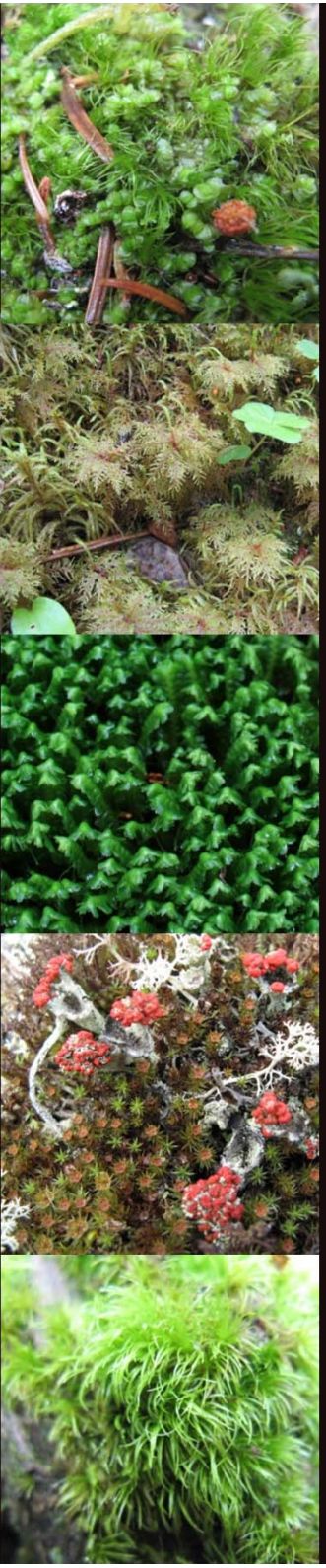
Total	33.8 ± 1.9 *a*	35.7 ± 2.6 *a*		

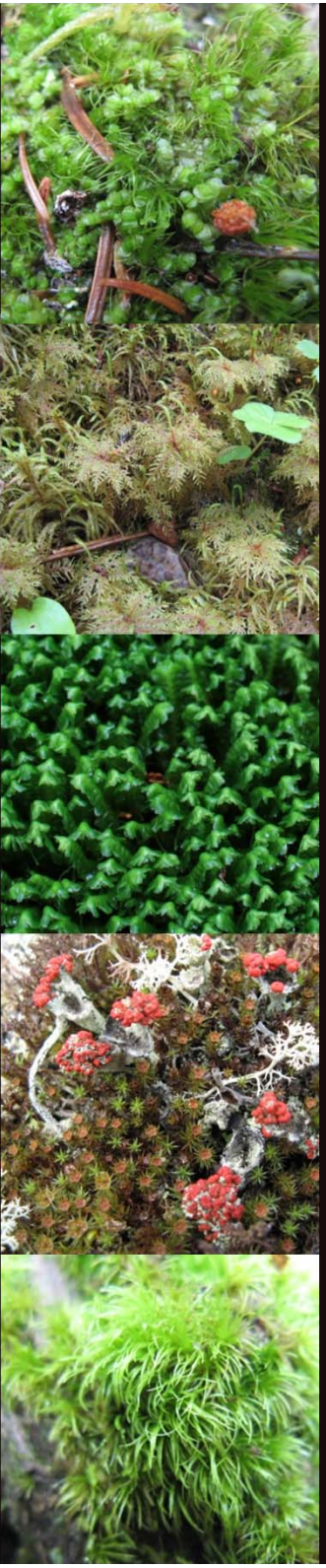
Mean species number by stand ± SE



Species richness

	Clearcuts	Wildfires		
	20-80 (18 stands)	20-100 (11 stands)	>100 (9 stands)	
Mosses	21.3 ± 1.2 *a*	22.5 ± 2.0 *a*	21.3 ± 2.6 *a*	
Liverworts	12.4 ± 0.9 *a*	13.2 ± 1.2 *ab*	17.8 ± 1.8 *b*	
Total	33.8 ± 1.9 *a*	35.7 ± 2.6 *a*	39.1 ± 4.1 *a*	

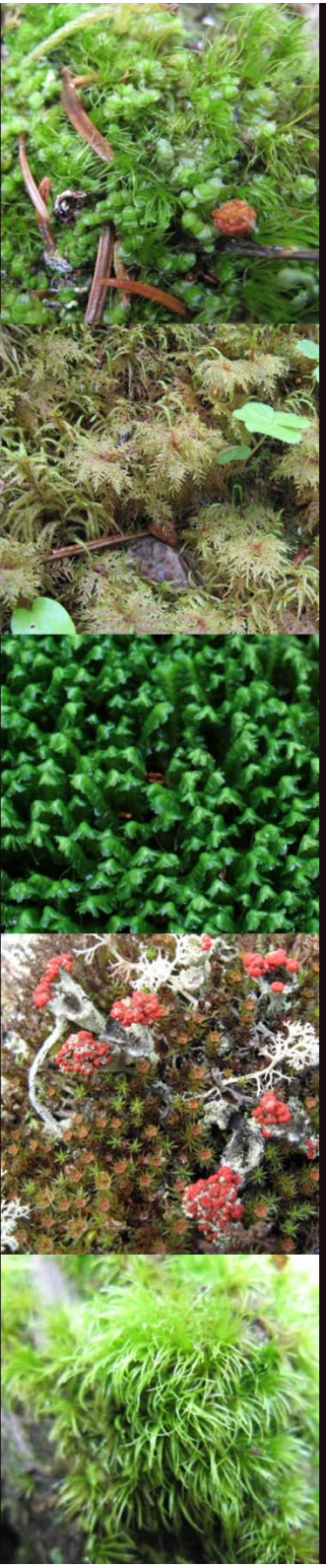
Mean species number by stand ± SE



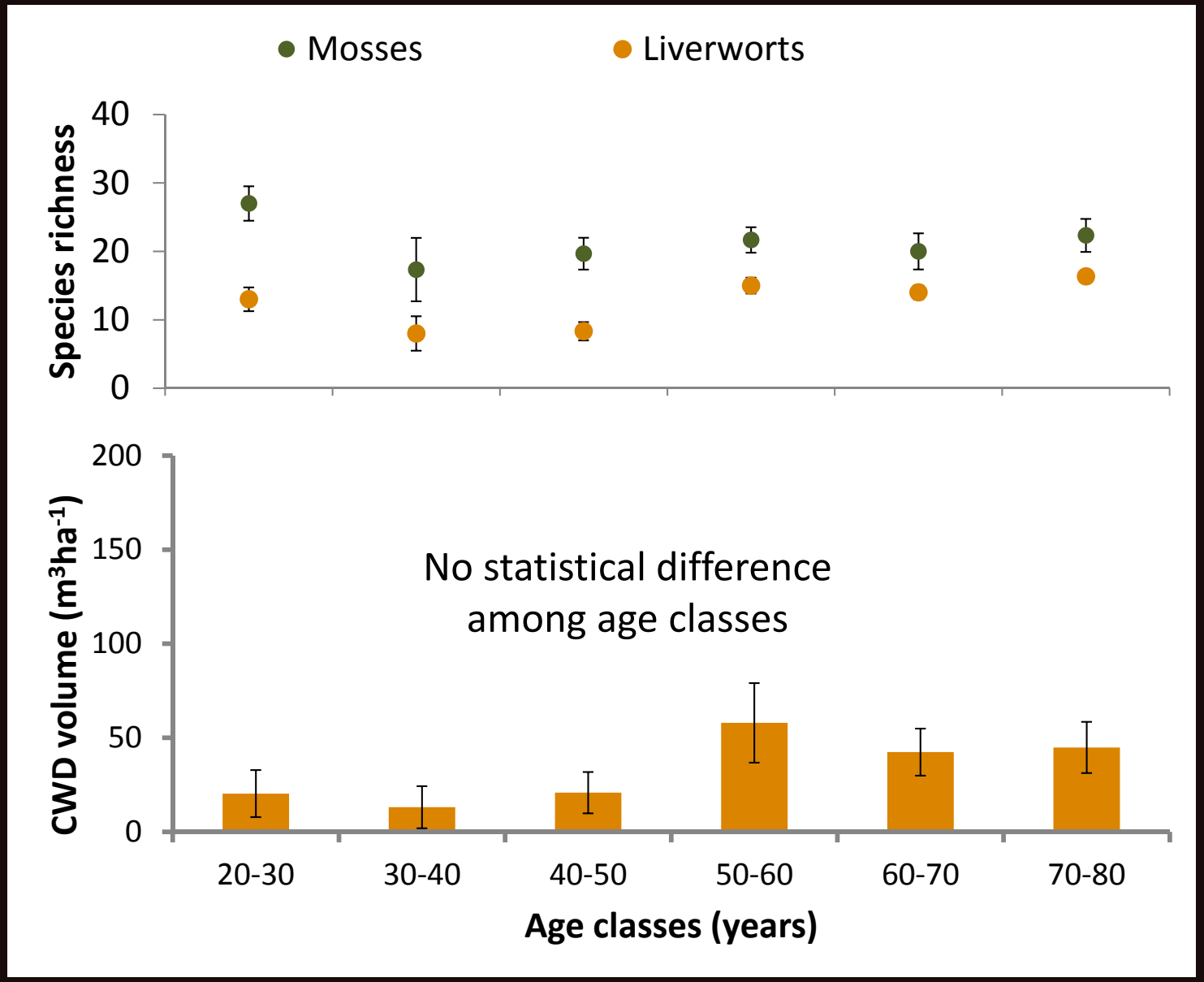
Species richness

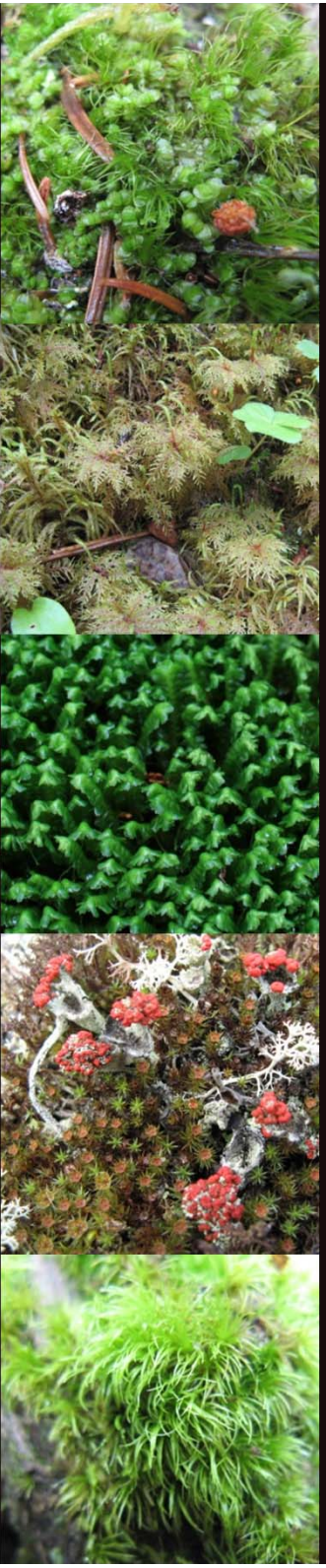
	Clearcuts	Wildfires		
	20-80 (18 stands)	20-100 (11 stands)	>100 (9 stands)	All (20 stands)
Mosses	21.3 ± 1.2 *a*	22.5 ± 2.0 *a*	21.3 ± 2.6 *a*	20.8 ± 1.7 *a*
Liverworts	12.4 ± 0.9 *a*	13.2 ± 1.2 *ab*	17.8 ± 1.8 *b*	14.4 ± 1.3 *ab*
Total	33.8 ± 1.9 *a*	35.7 ± 2.6 *a*	39.1 ± 4.1 *a*	35.2 ± 2.7 *a*

Mean species number by stand ± SE



Species richness and dead wood : Clearcuts





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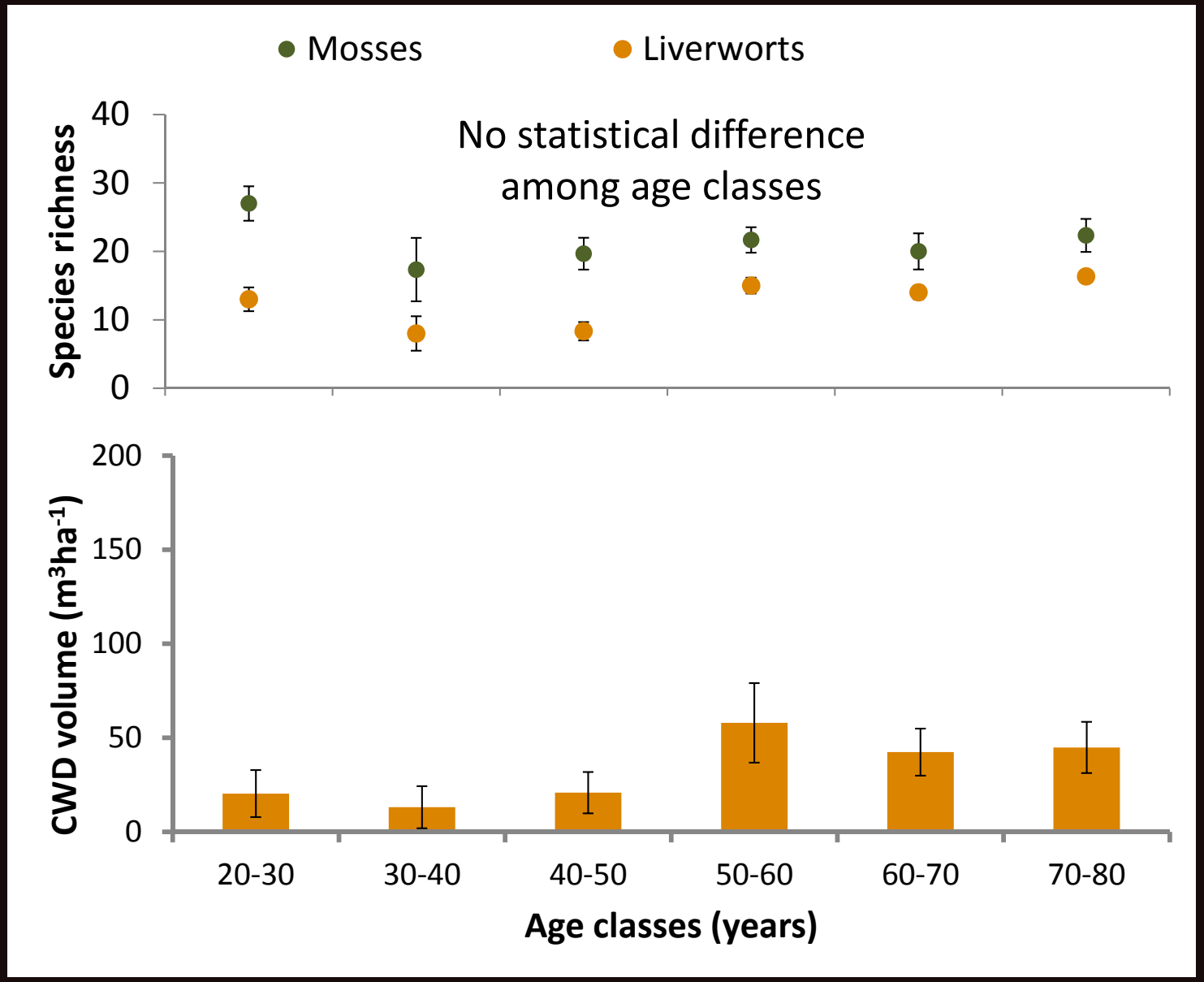

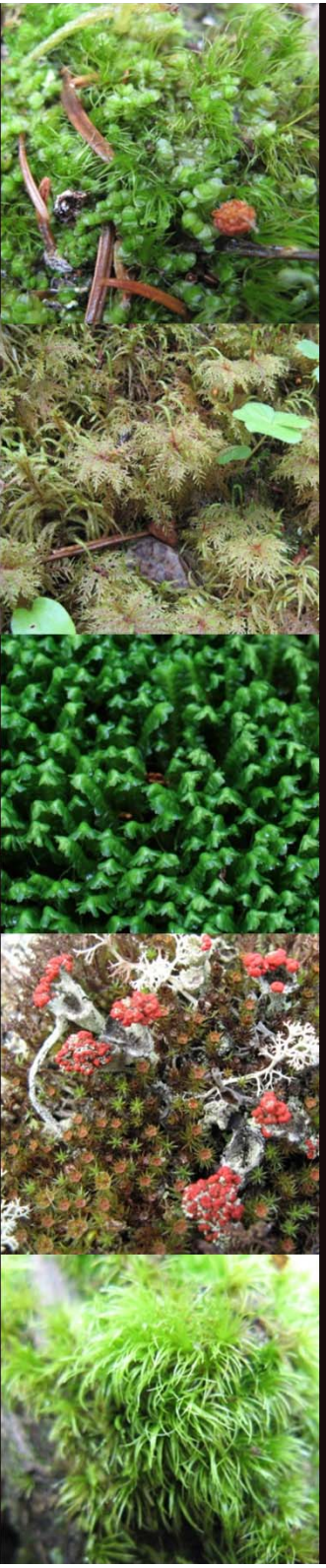

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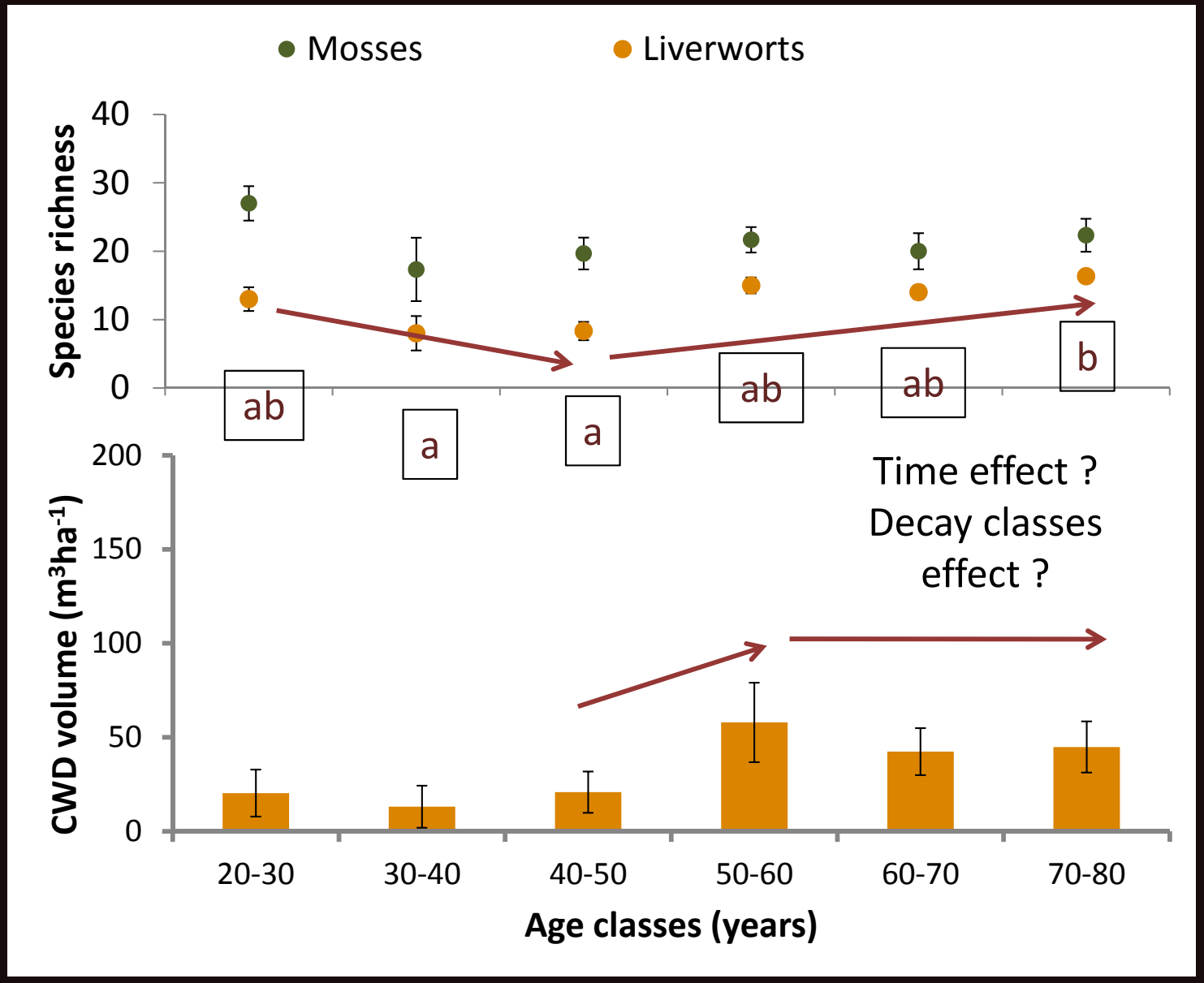

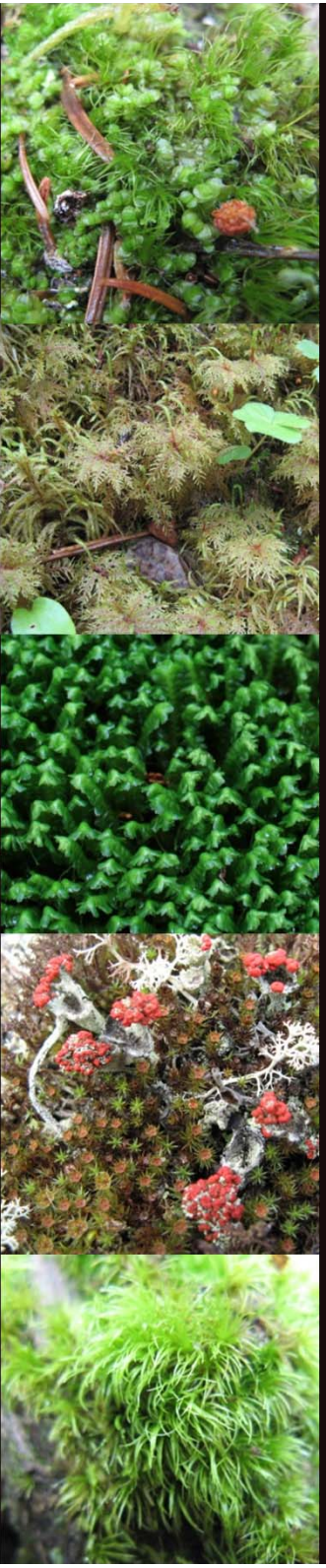

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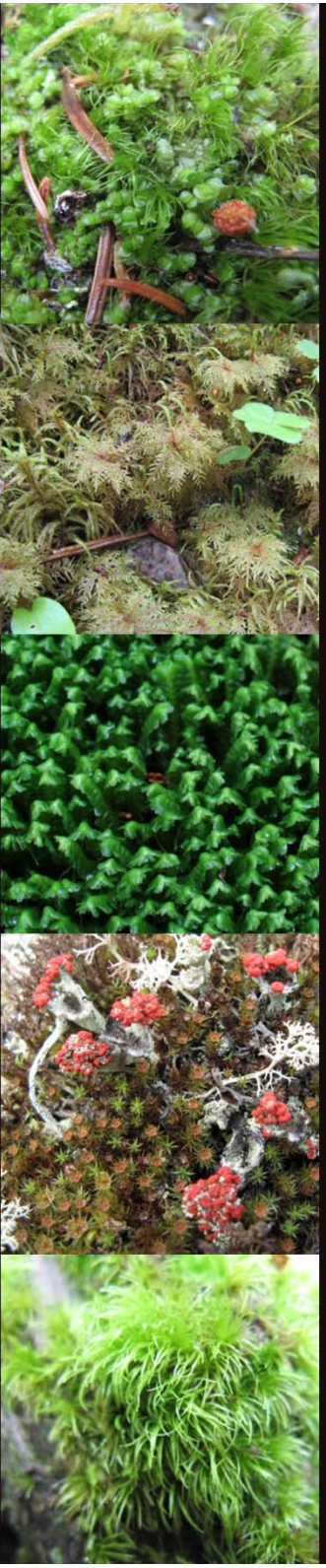

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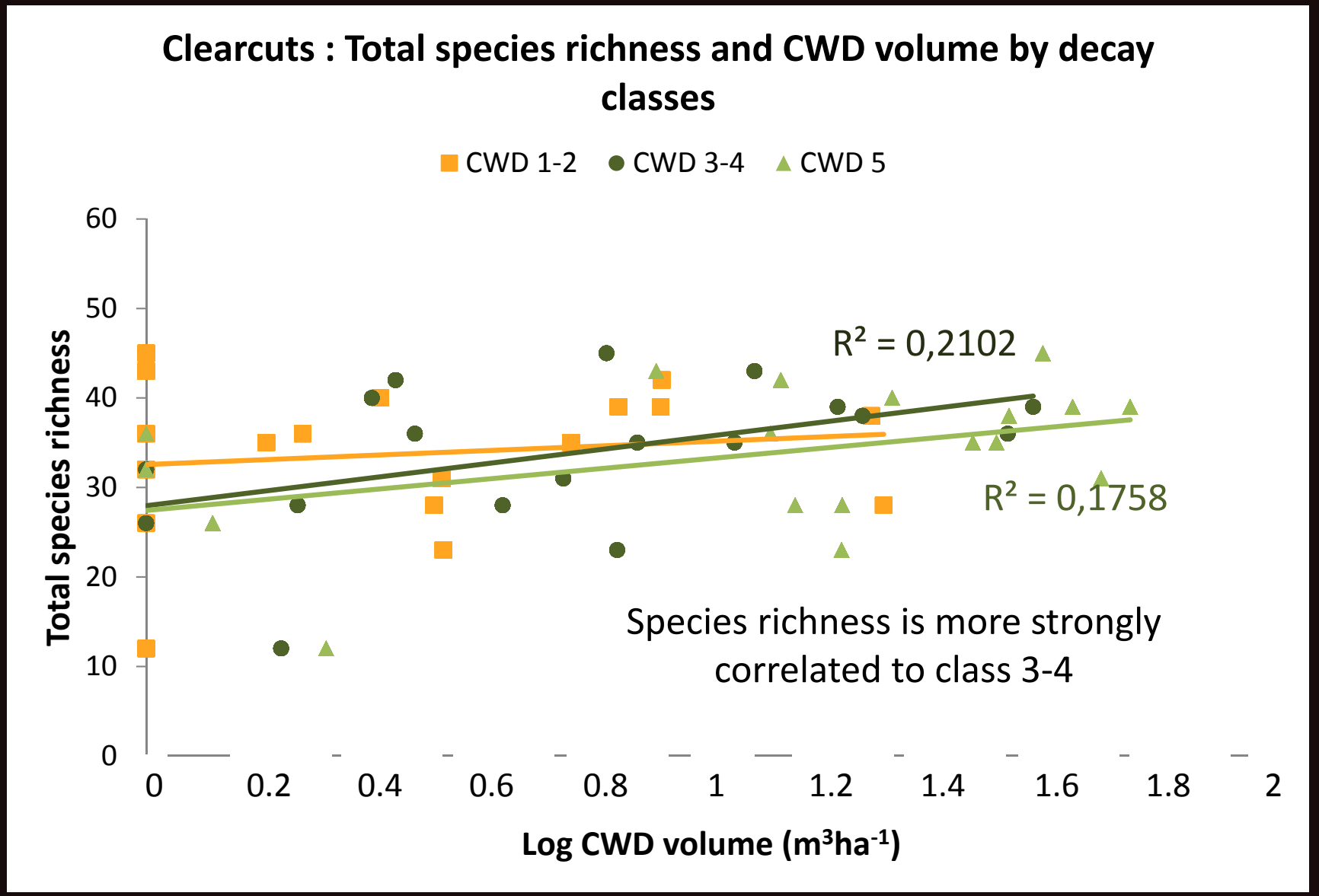
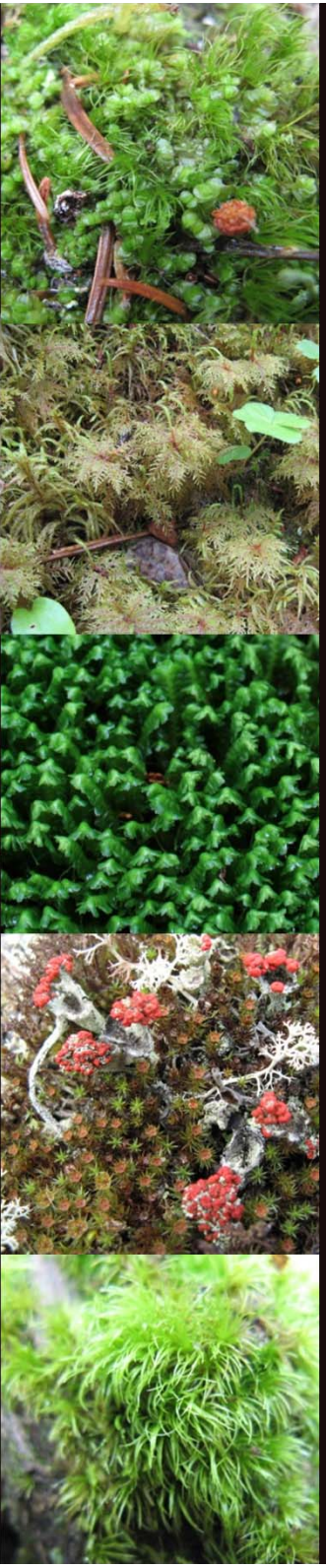
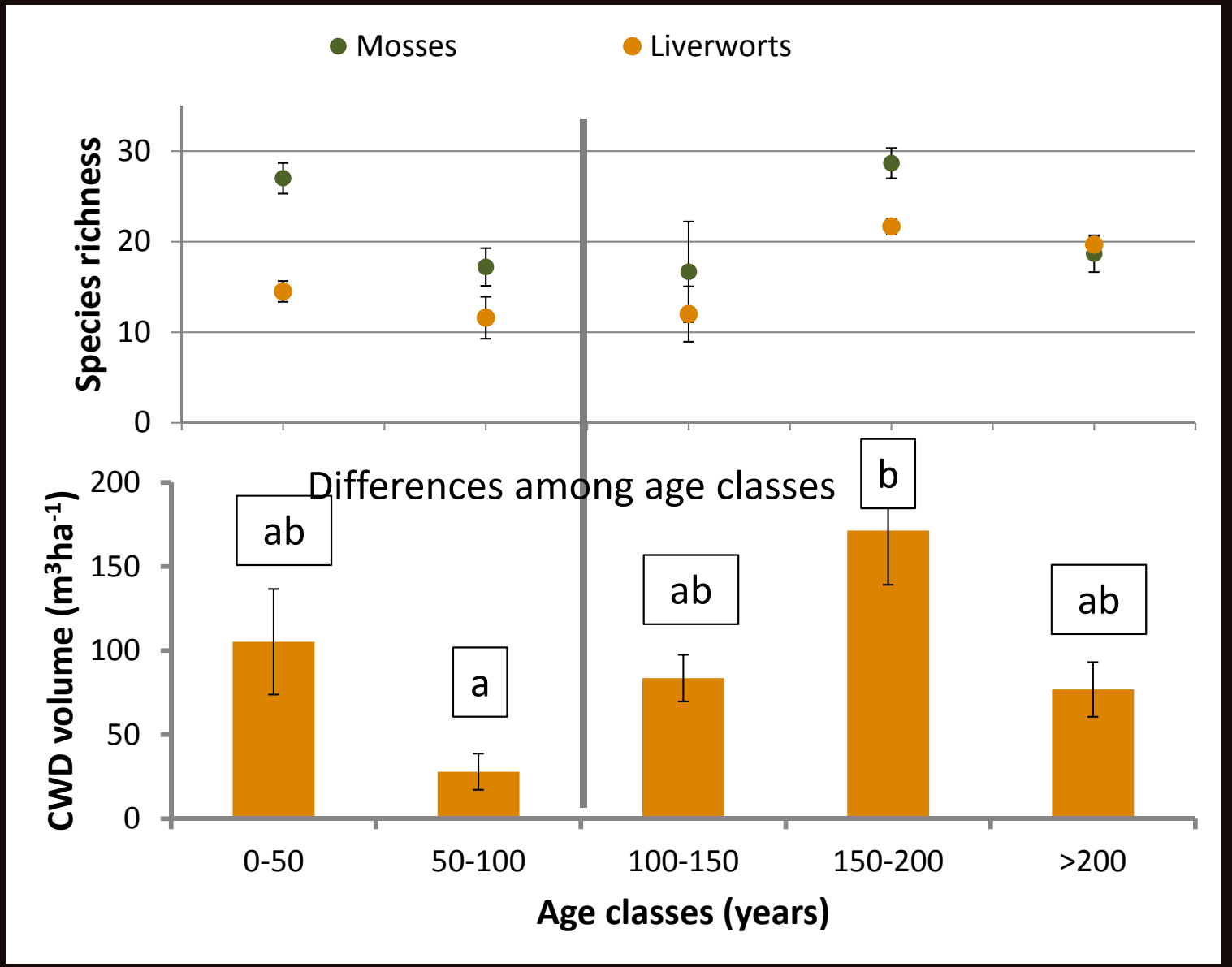
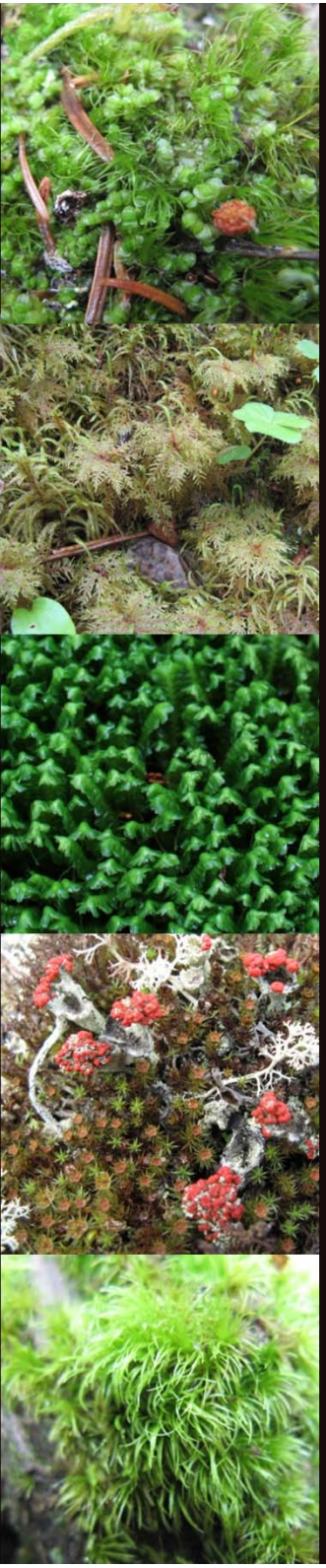




Species richness and dead wood : Wildfires





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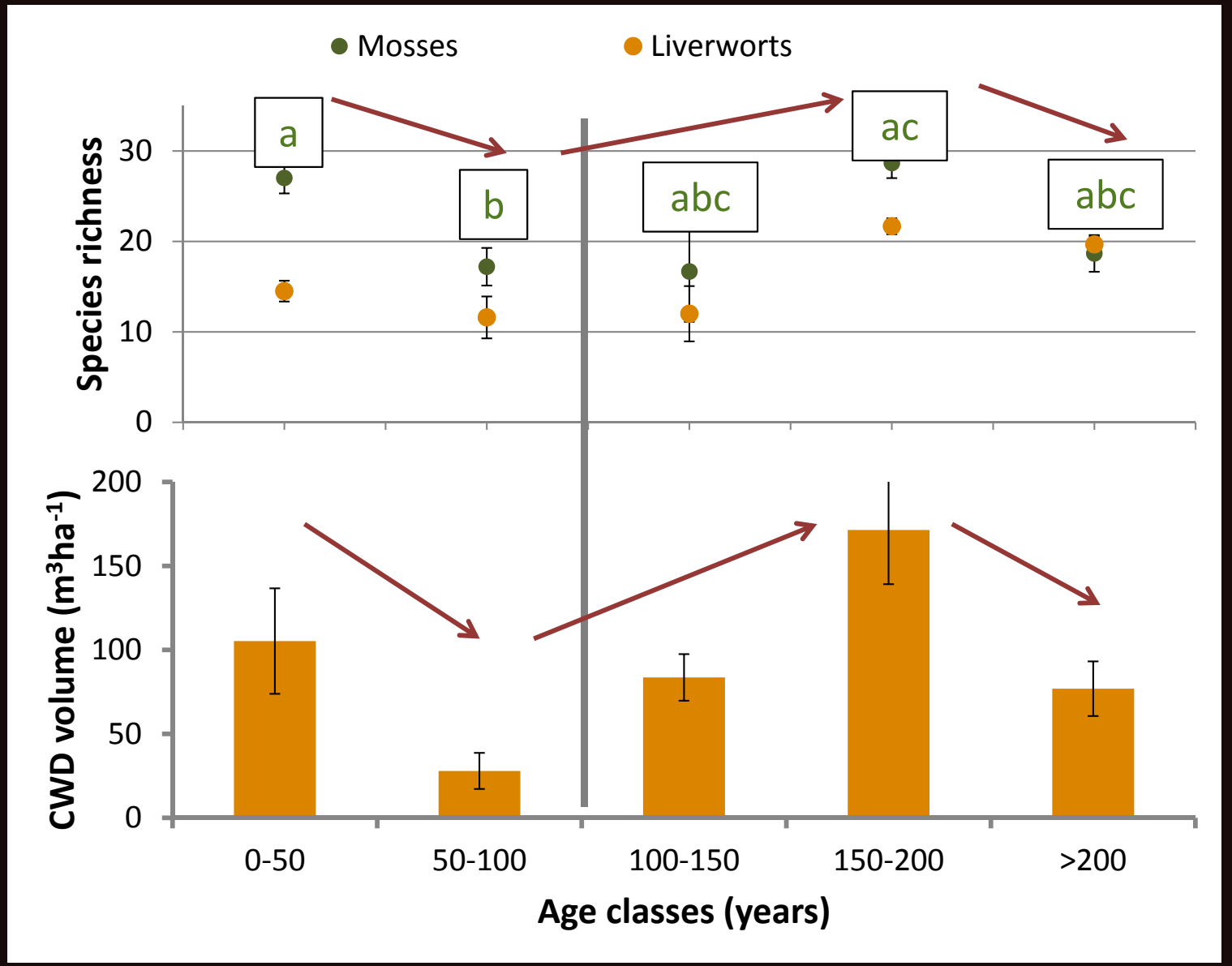

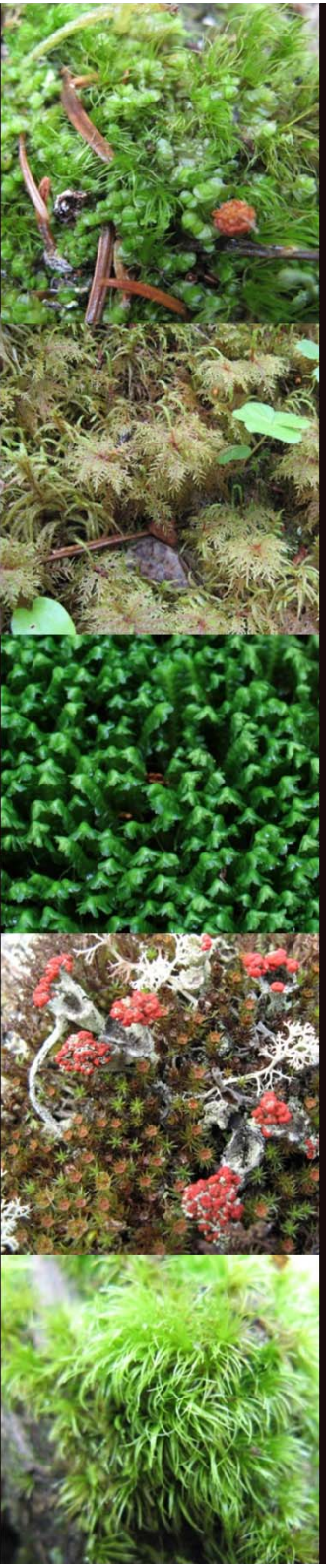

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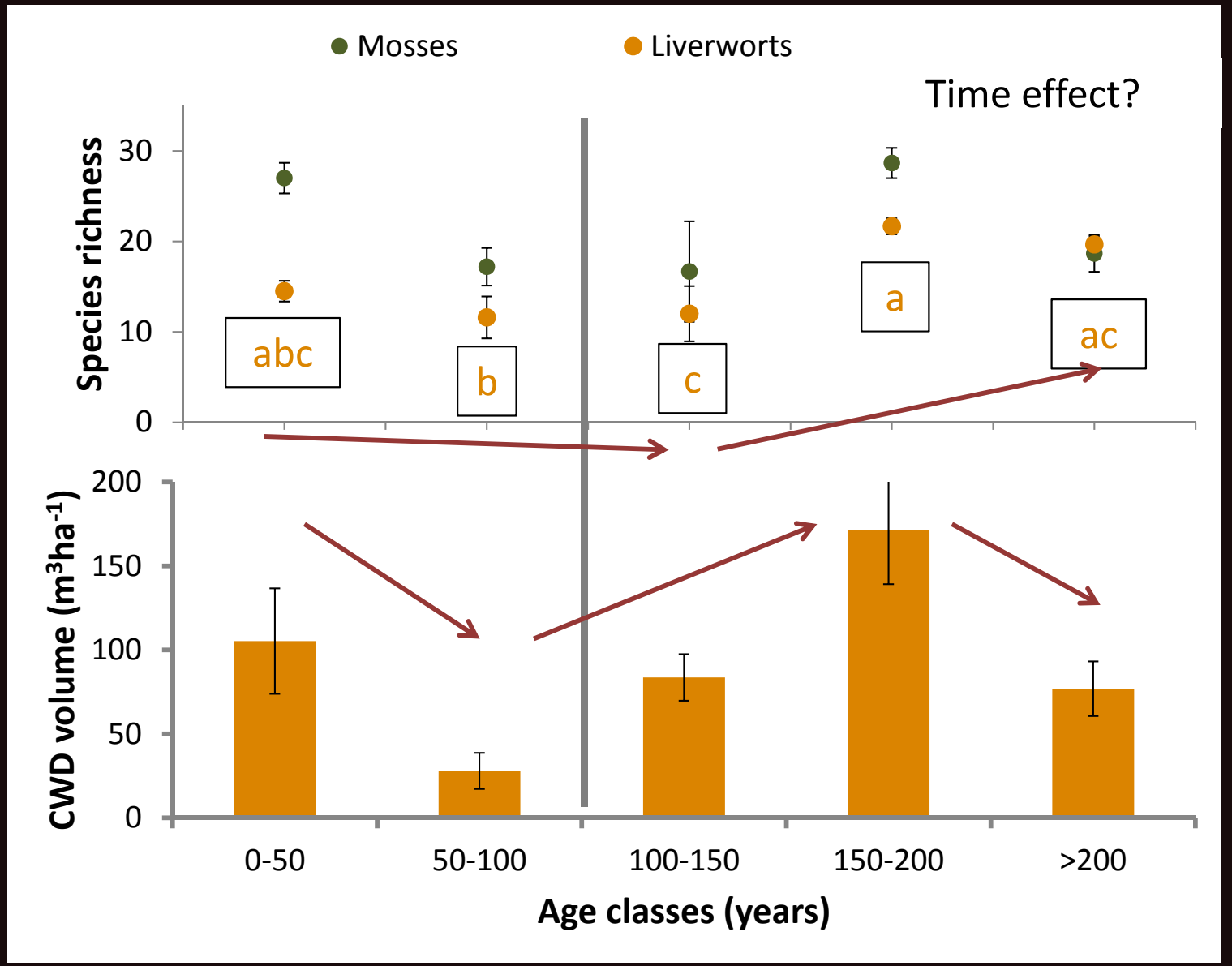

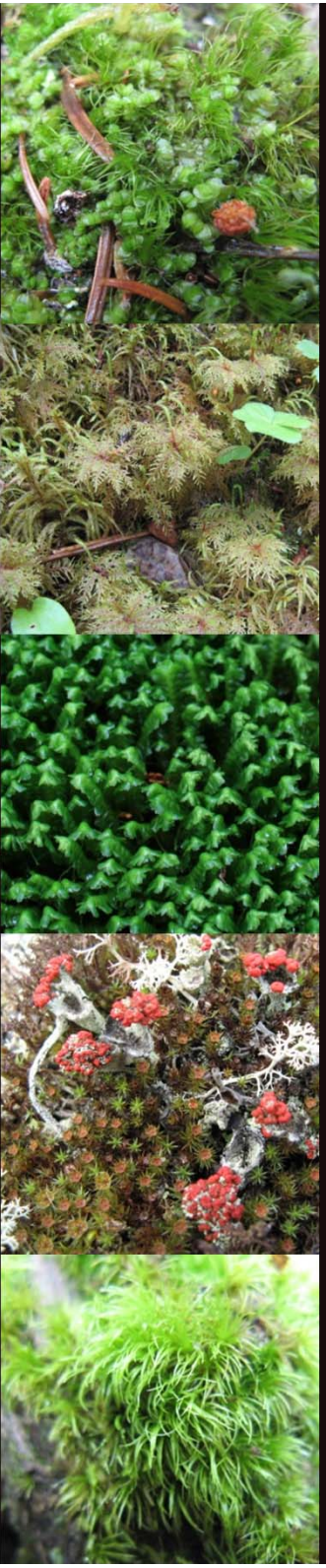

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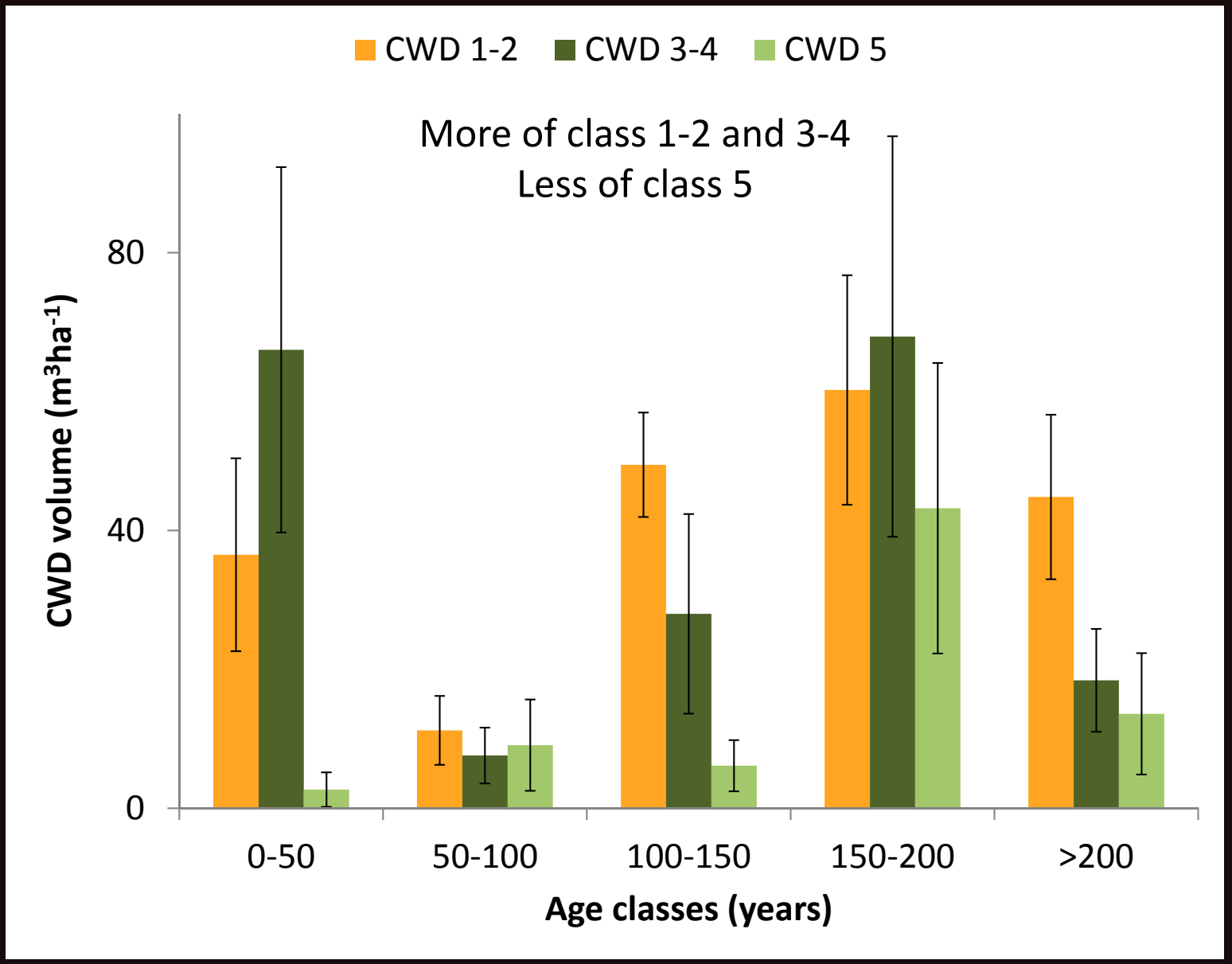

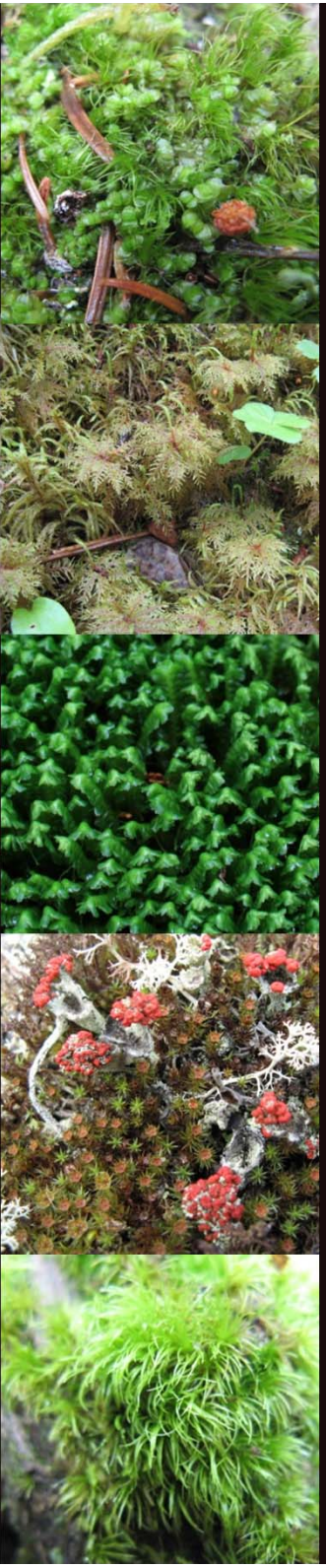

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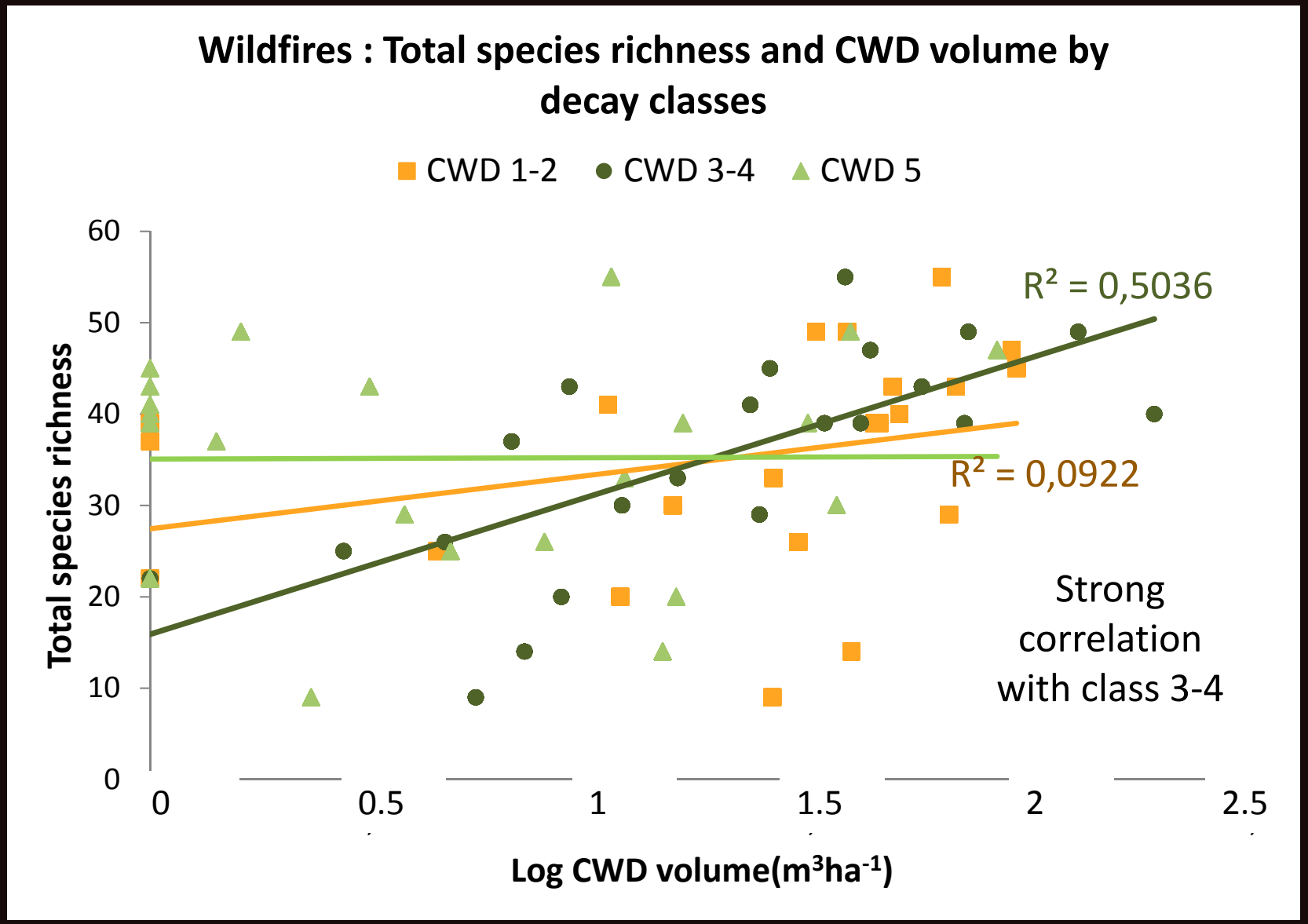
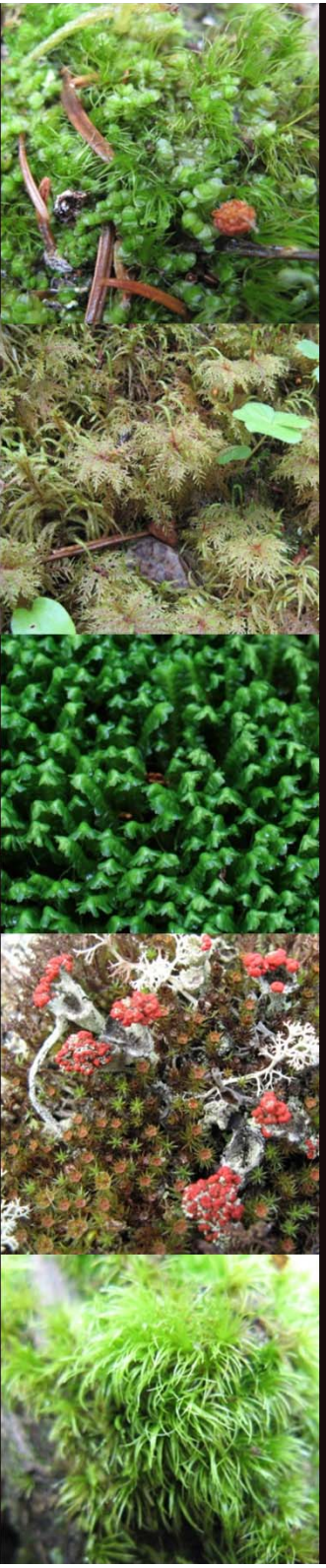
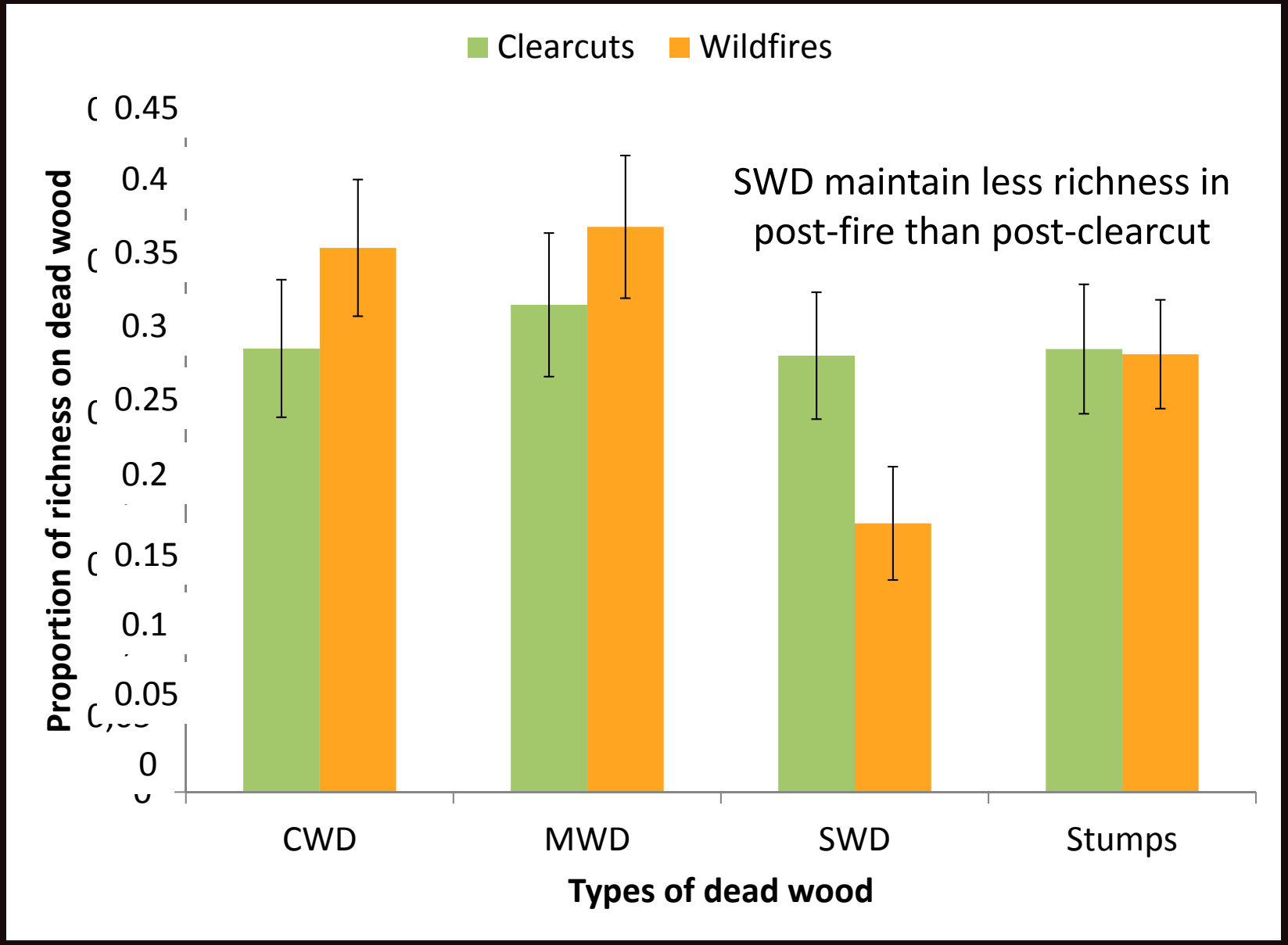
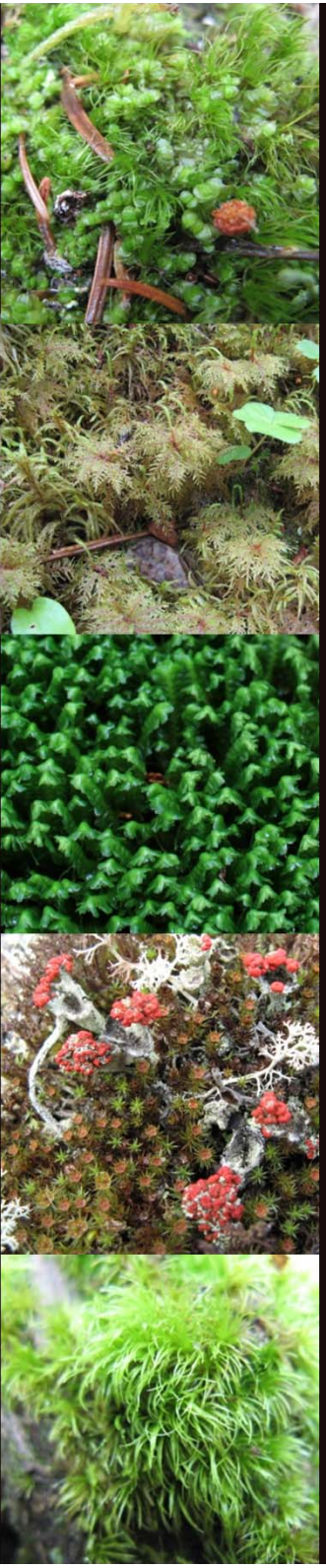




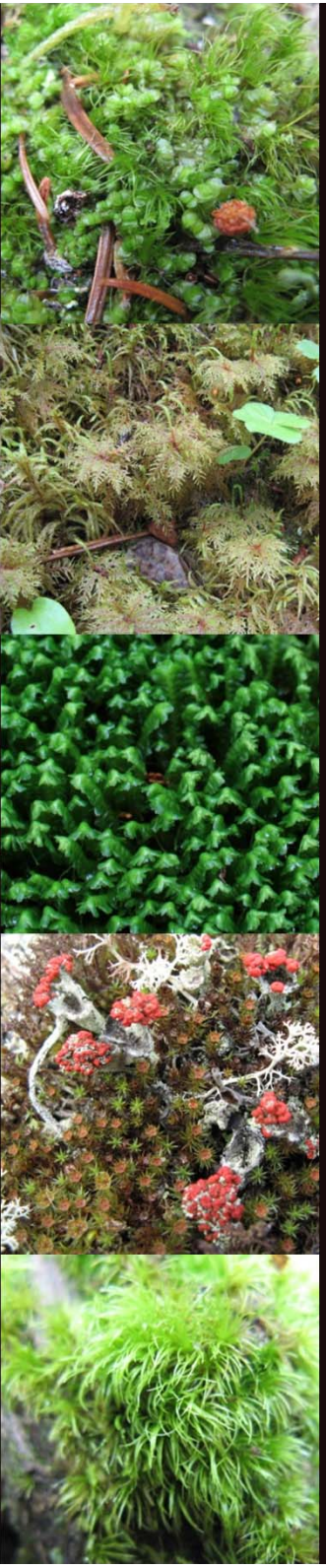
Proportion of richness by types of dead wood





Conclusion

- Species richness:
  - No difference between disturbances at similar ages
  - Post-fire stands over 100 years : liverworts (time)
  - Composition differences?
- Richness related to CWD :
  - Strongly related to decay class 3-4 (more suitable)
- All types of dead wood
  - SWD maintain a higher proportion of richness in post-clearcut



Thank you!

Special thanks to Nicole Fenton
and Anne Allard-Duchêne!

Fonds de recherche sur la nature et les technologies Québec

Chaire de recherche industrielle CRSNG - Université Laval en sylviculture et faune

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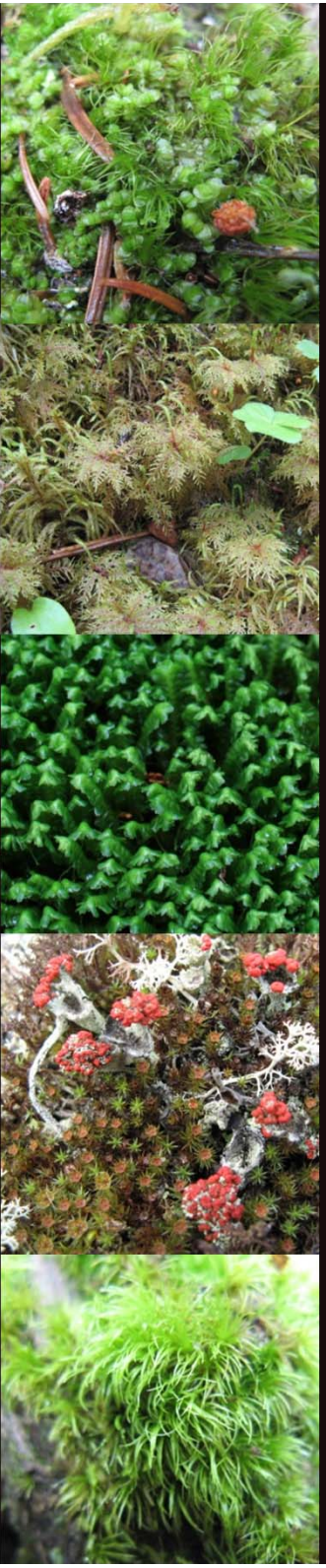
Julie Gravel Grenier
Martine Lapointe

Supervision

David Pothier
Yves Bergeron

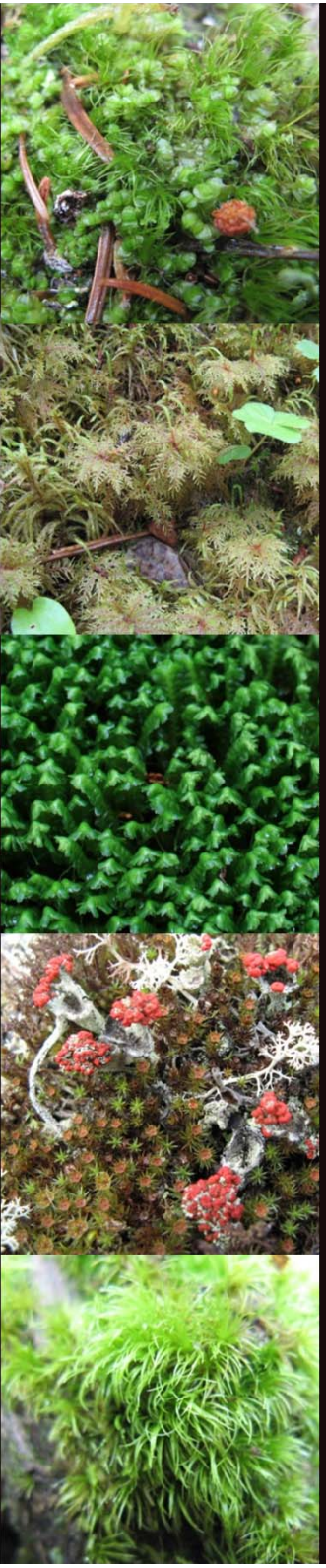
Field helpers

Jean-Philippe Roussy
Édith Lachance
Julien Pelletier
Sébastien Lavoie
Jérémie Fuller



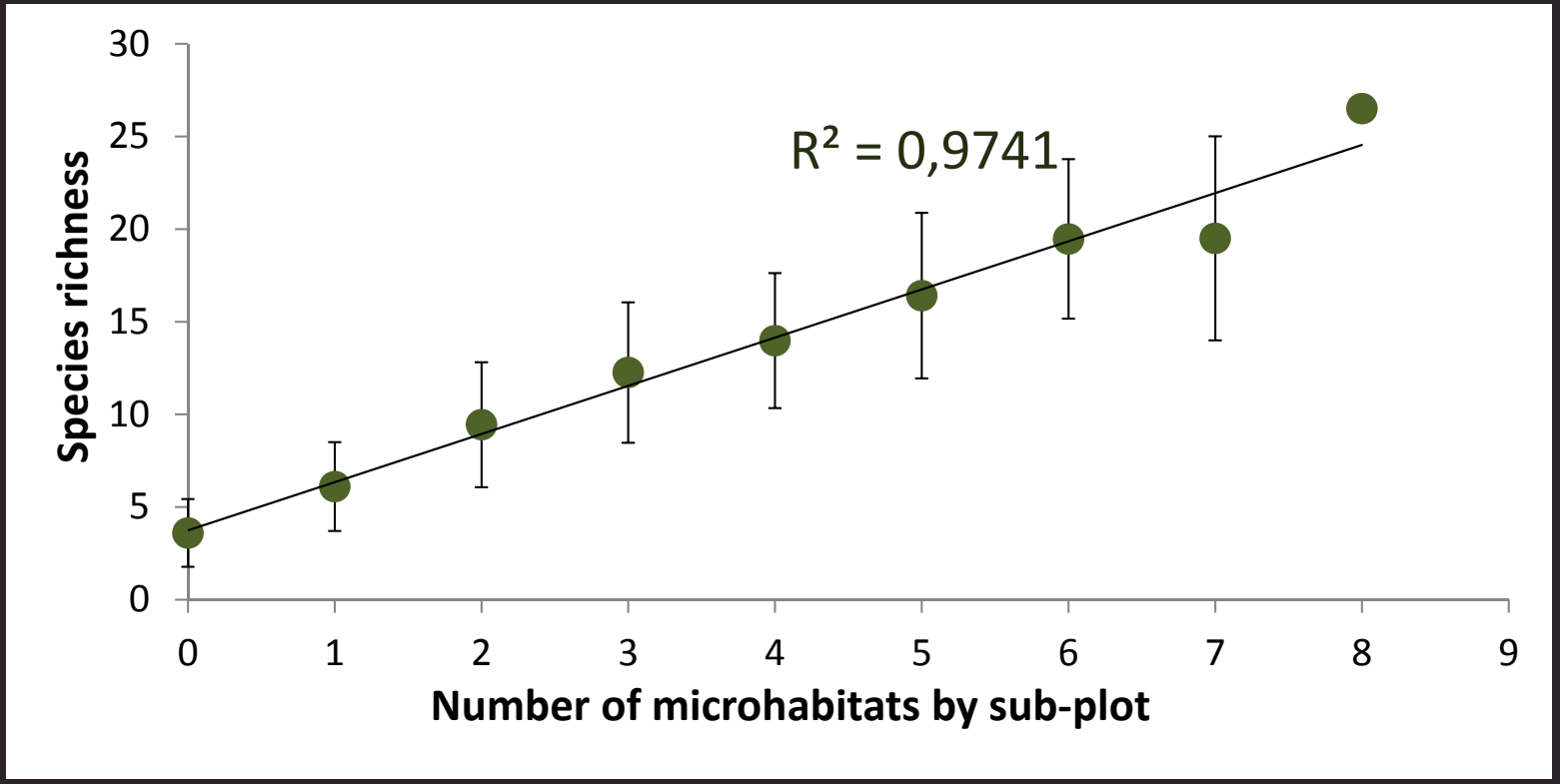
Forest management

- Windthrows -> partial cut and clearcut with trees retention
- Salvage logging after windthrow

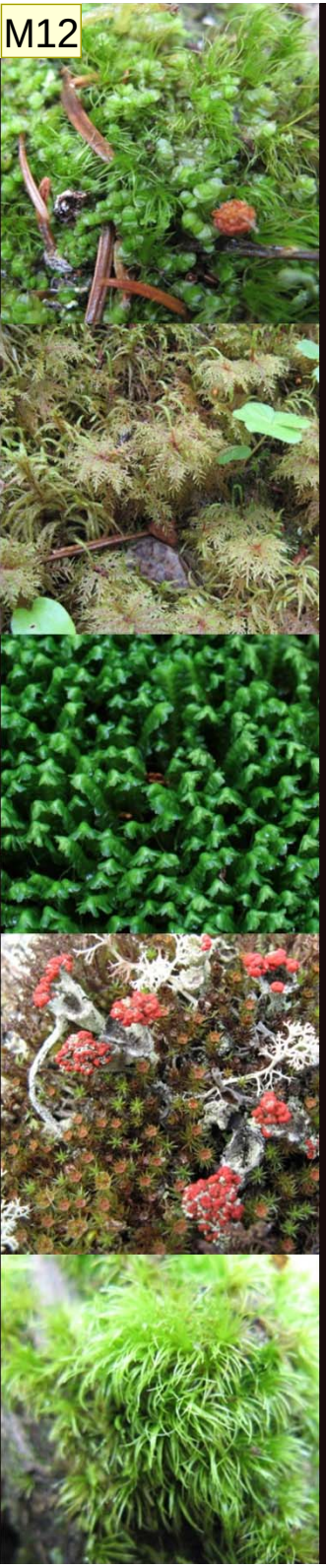


Richness and microhabitats

- CWD, MWD, SWD, stumps, trunk base, mineral soil and rock
  - Specialist species
  - Abundance↑ bryophytes richness



M12



Species richness

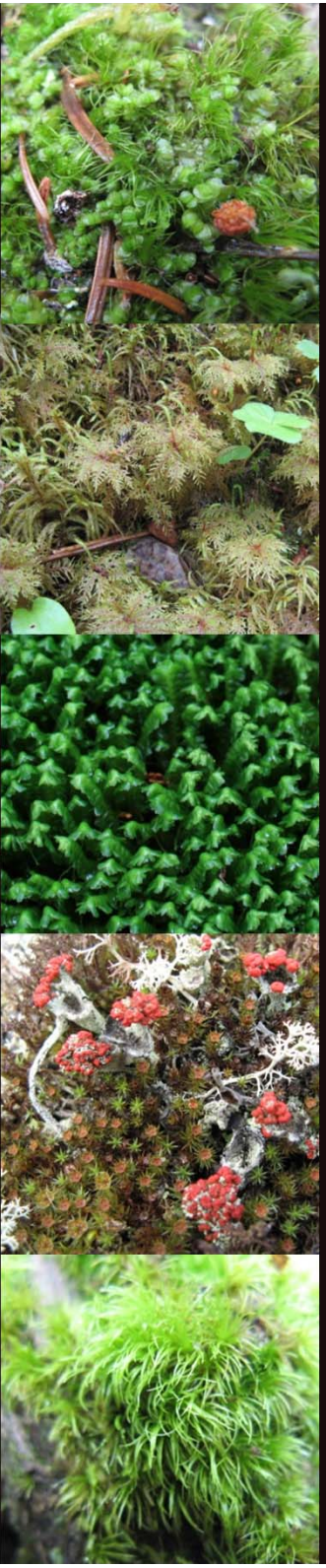
	Clearcuts	Wildfires		
	20-80 (18 stands)	20-100 (11 stands)	>100 (9 stands)	All (20 stands)
Mosses	56 (21.3±1.2*a*)	59 (22.5±2.0*a*)	52 (21.3±2.6*a*)	69 (20.8±1.7*a*)
Liverworts	33 (12.4±0.9*a*)	35 (13.2±1.2*ab*)	34 (17.8±1.8*b*)	37 (14.4±1.3*ab*)
Total	89 (33.8±1.9*a*)	94 (35.7±2.6*a*)	86 (39.1±4.1*a*)	106 (35.2±2.7*a*)

Species richness
(Mean species number by stand ± SE)

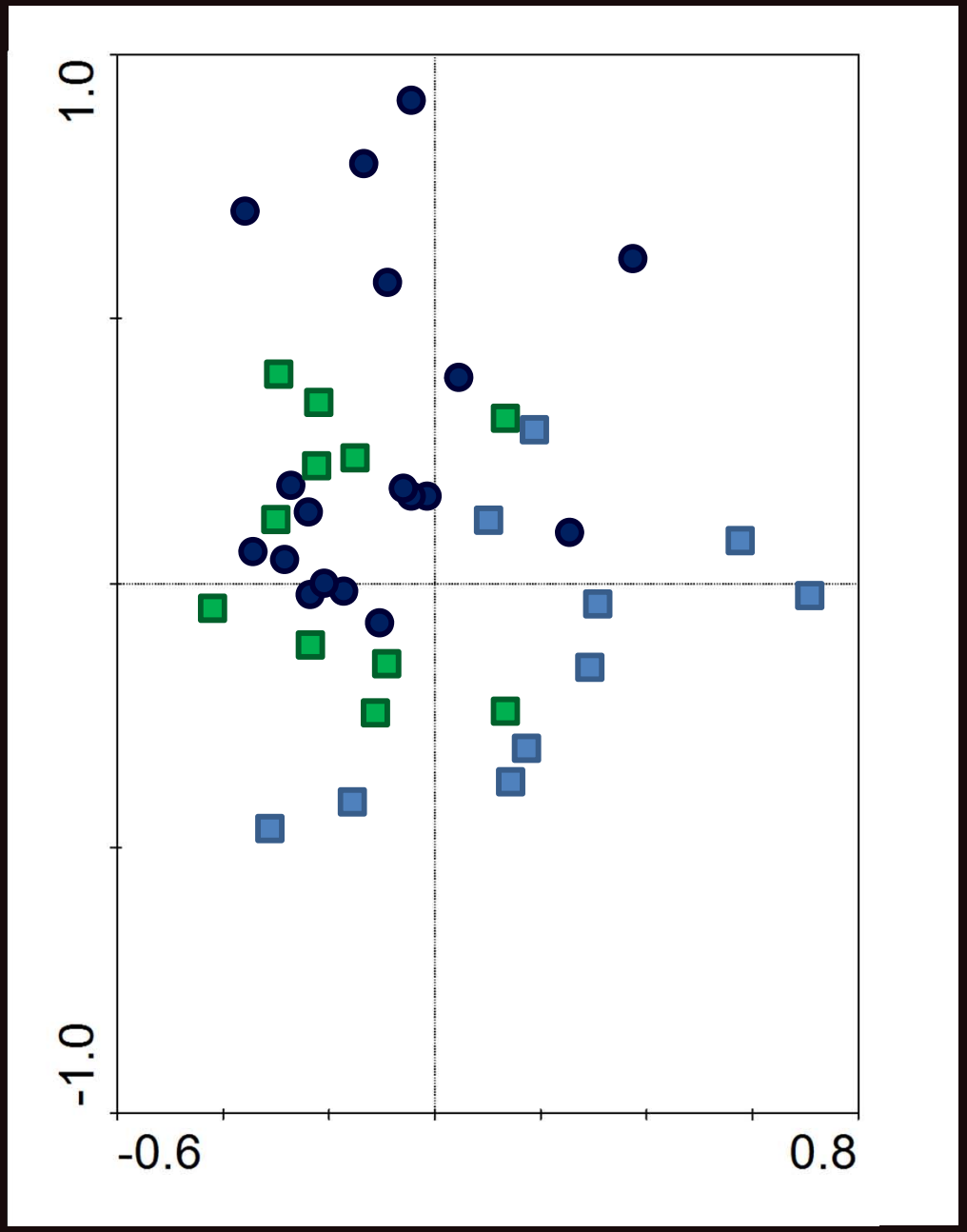
Diapositive 33

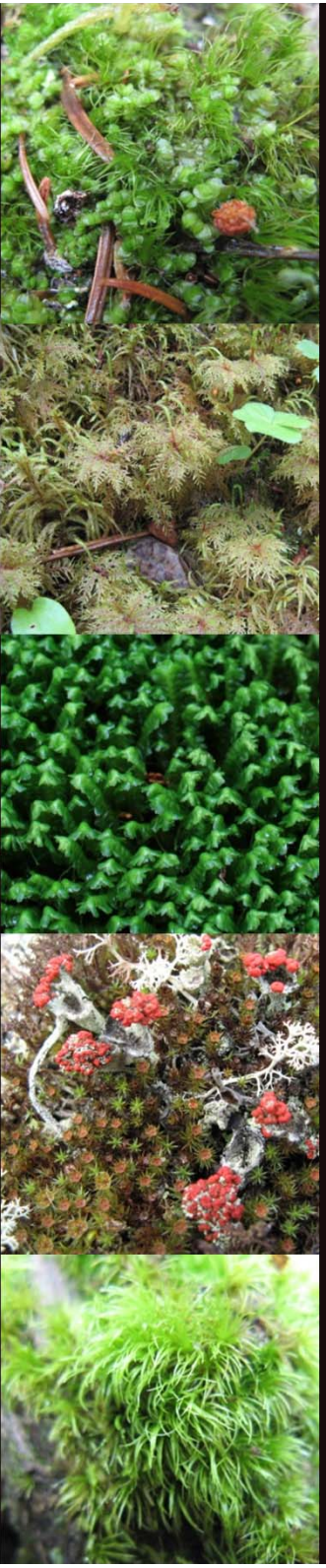
M12 Comparaisons multiples à faire

Myriam; 2011-04-06



CCA of stands





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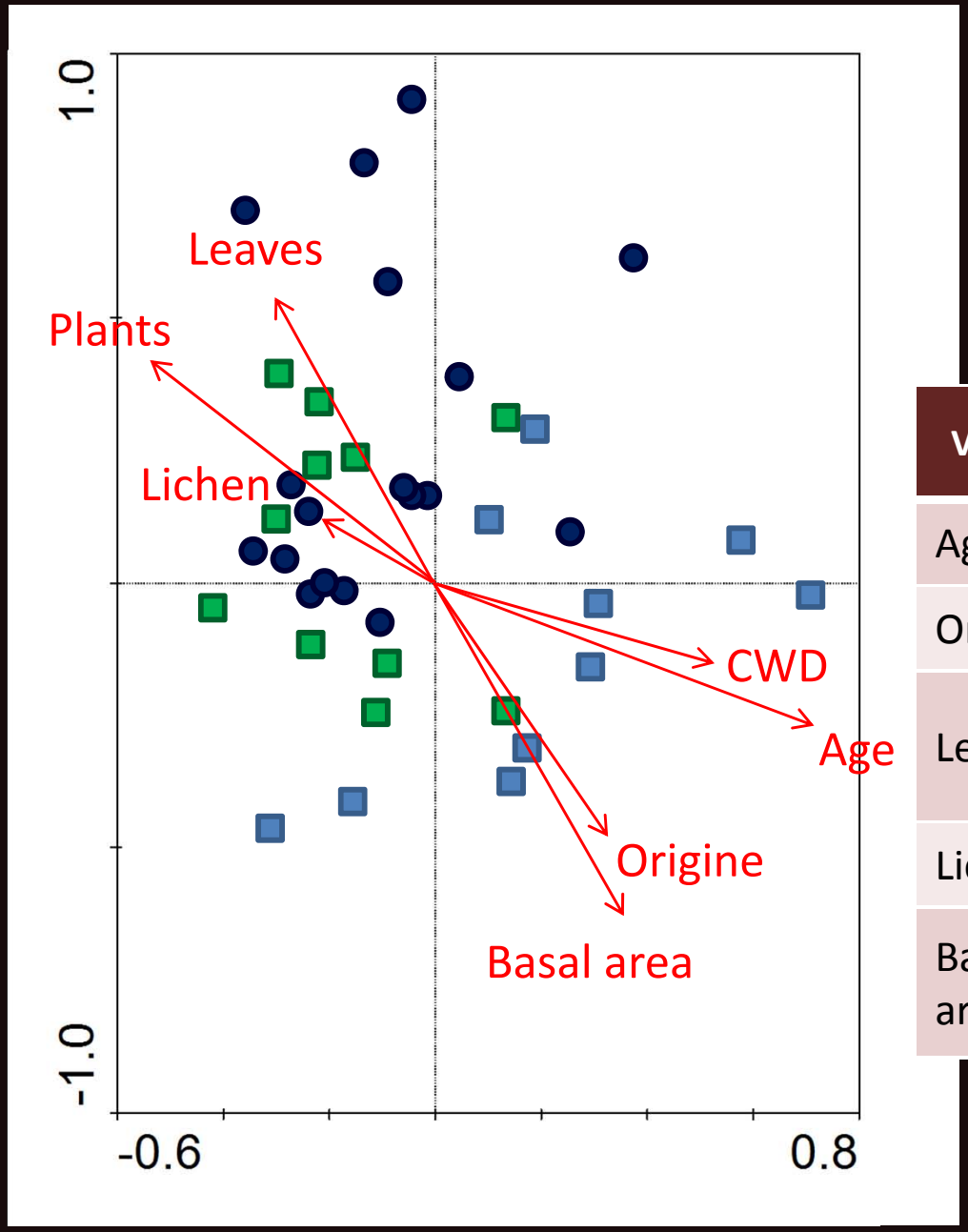
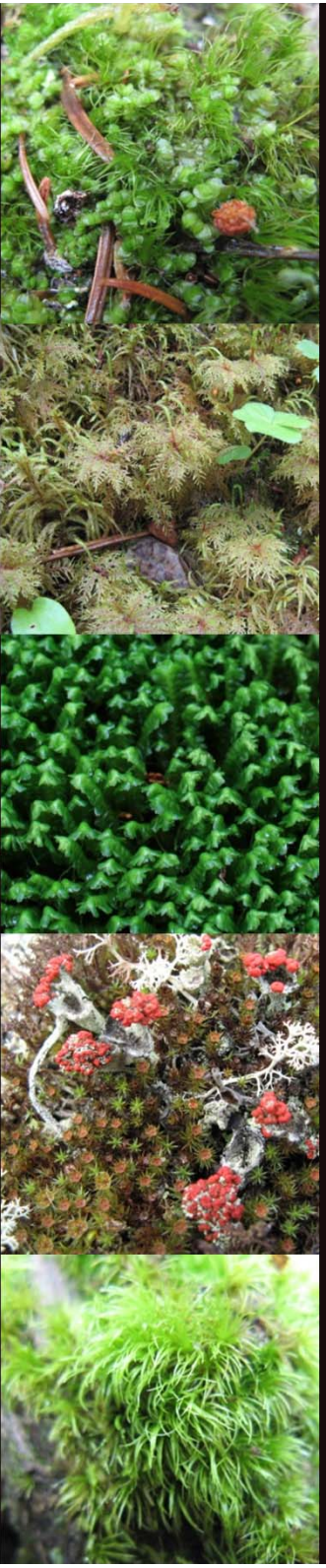
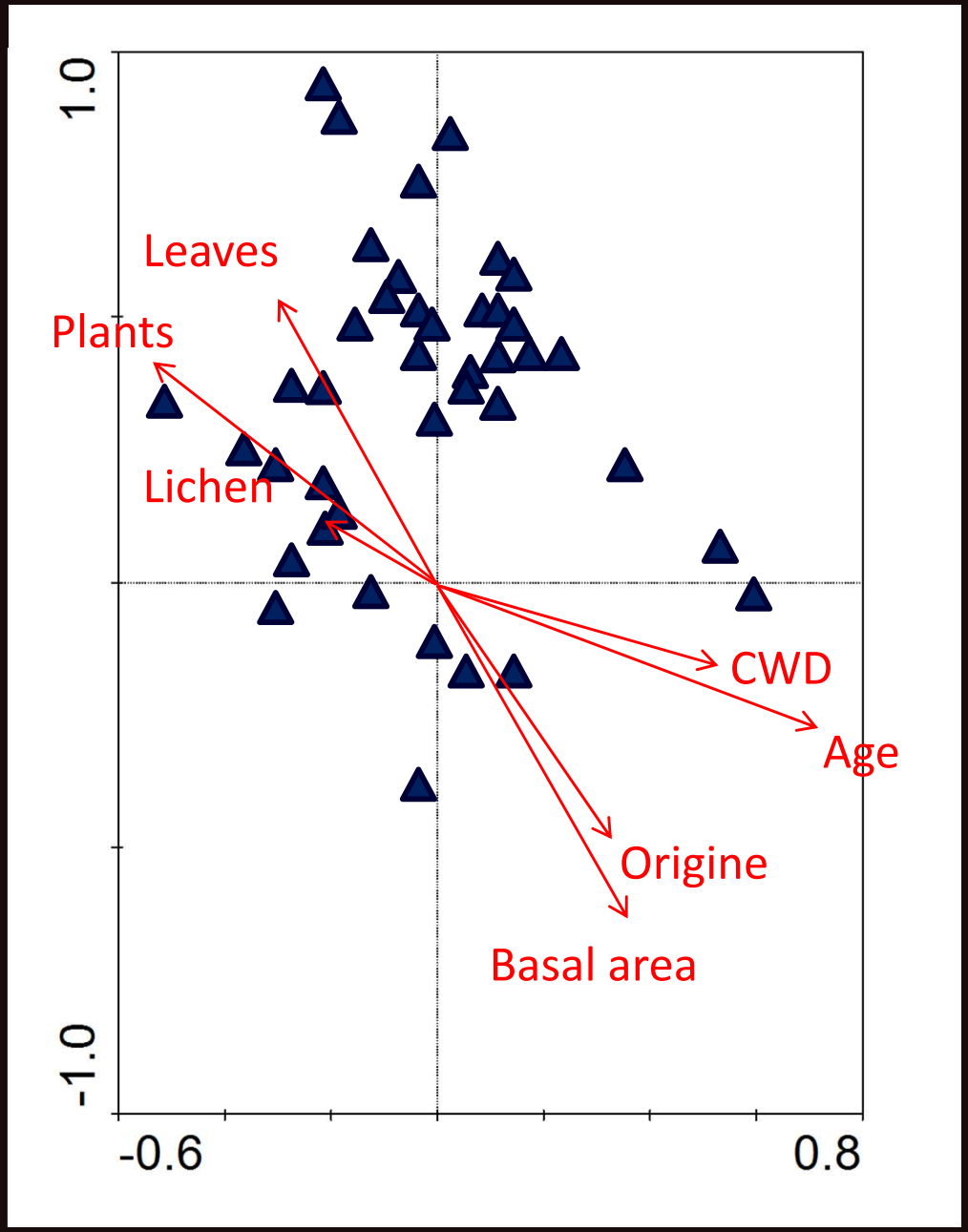
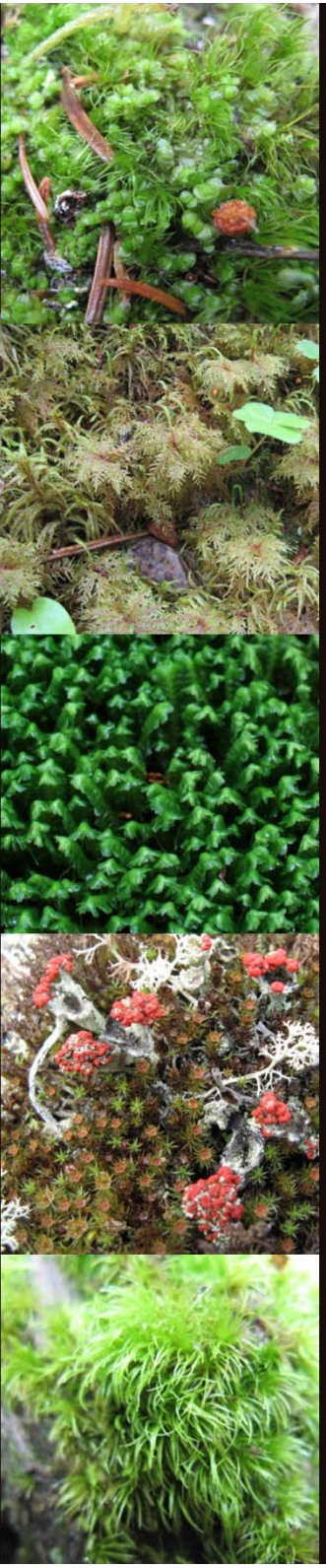
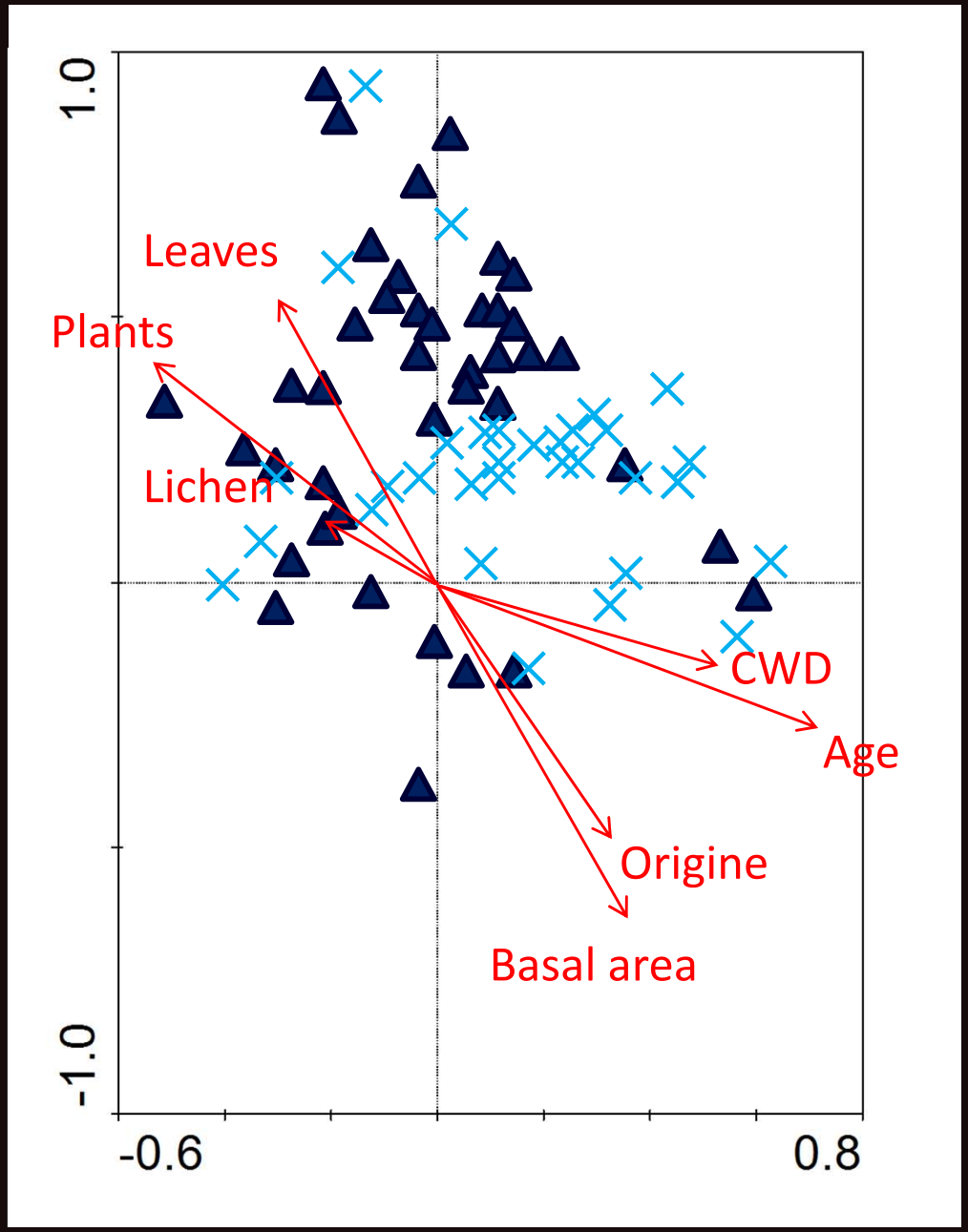


Variables	Pseudo-F	*p*
Age	6.68	0.002
Origine	3.34	0.002
Leaves	3.26	0.002
Lichens	3.16	0.006
Basal area	2.01	0.046



CCA of species





CCA of species