Tree-related microhabitats (TreMs) in Romanian old-growth forests

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5th INTERNATIONAL CONFERENCE
Old-growth forests: policy and practice
October 16 - 17, 2025, Jaunkalsnava, Latvia

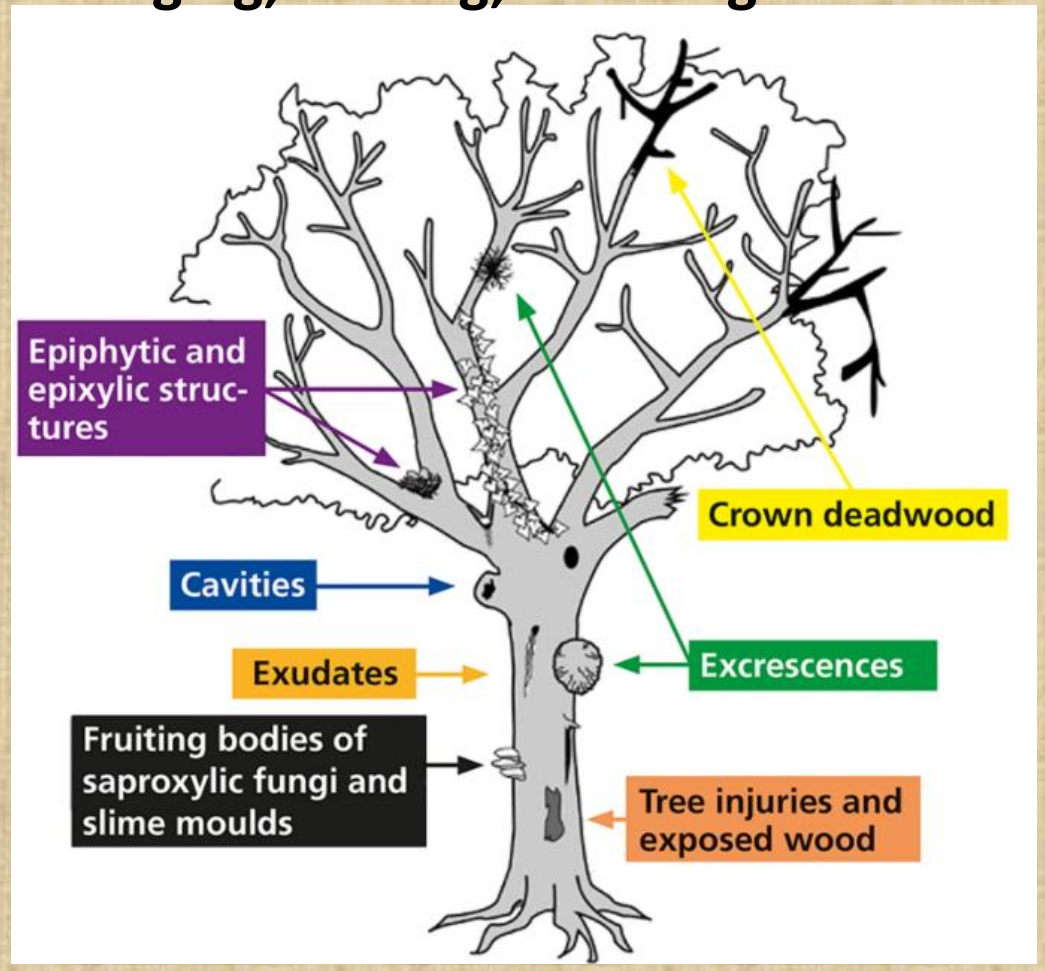
Habitat trees- key elements for forest biodiversity

Standing trees that **bear structures** needed by many species for **foraging, nesting, breeding**.

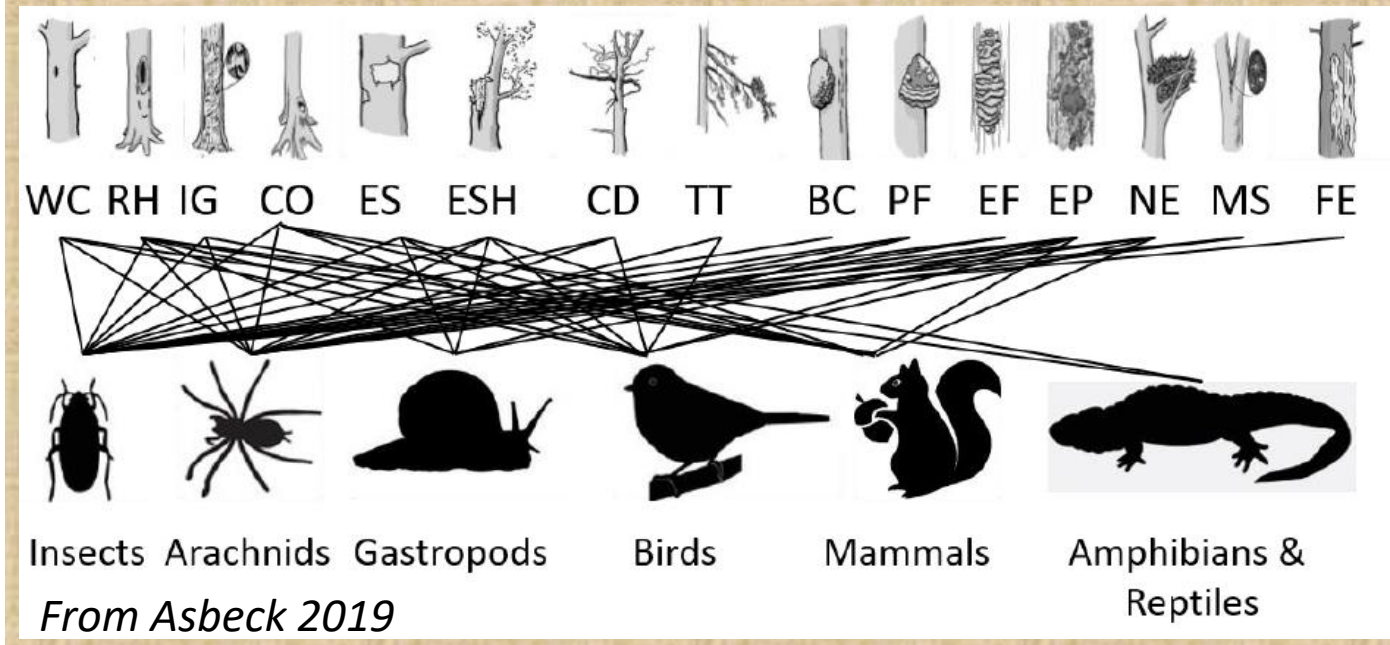
→ Tree-related microhabitats (TreMs)

↓

was grouped in 15 groups (Larrieu et al. 2018)



A habitat tree (*adapted from Larrieu et al. 2018)*



From Asbeck 2019

WC = woodpecker cavities, RH = rot holes containing mould, IG = insect galleries and bore holes, CO = concavities, ES = exposed sapwood only, ESH = exposed sap and heartwood, CD = crown deadwood, TT = twig tangles, BC = burrs and cankers, PF = perennial fungal fruiting bodies, EF = ephemeral fungal fruiting bodies, EP = epiphytic or parasitic crypto- and phanerogams, NE = nests, MS = microsoils, FE = fresh exudates

Objectives

To analyze and compare the occurrence and diversity of Tree-related Microhabitats (TreMs) in virgin and managed forests growing under similar environmental conditions, across different forest types in Romania.

All trees with a DBH>30 cm in sample plots of….

Sessile oak-beech forests
2 plots of 0.56 ha in each OG and MG forest
284 trees in MF
203 in VF

Pure beech forests
4 plots of 0.25 ha in each VG and MG forest
237 trees in MF
179 in VF

Pure spruce forests
1 plot of 0,5 ha
125 trees in MF
83 in VF

Silver fir beech forests
5 plots of 0,25 ha in each forest
215 trees in MF
207 in VF

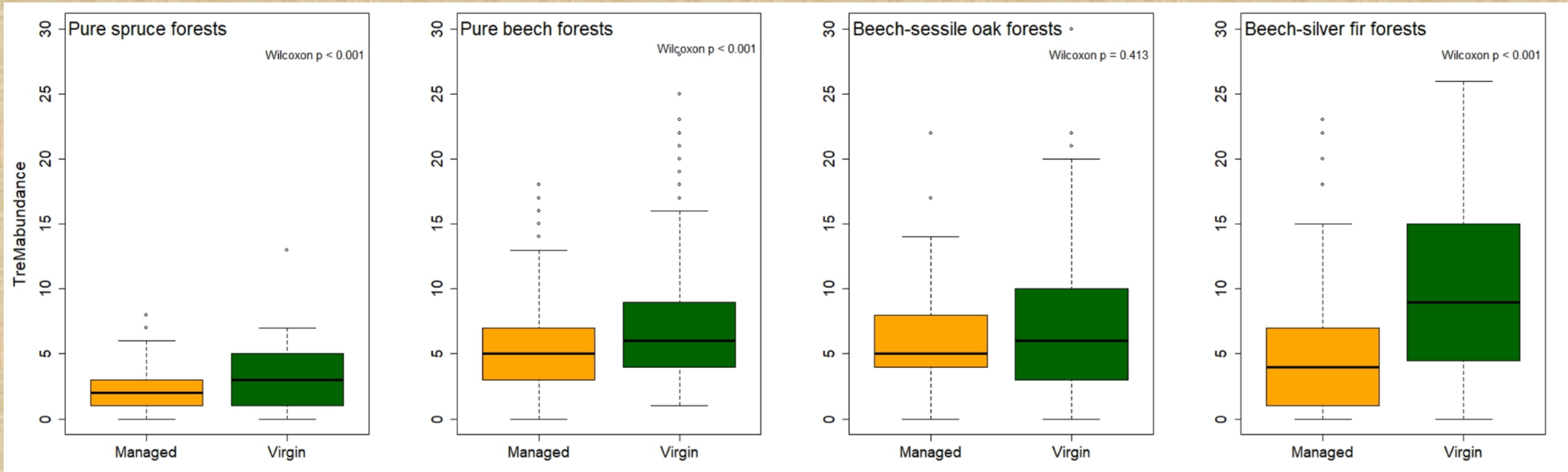
Material and methods

For each tree with a DBH >30 cm, **the TreM** according to Catalogue of tree microhabitats **(**Kraus et al. 2016) were noted

Cavitati de ciocanitoare	CV 11	Intrarea in cavitate ø<4cm cu ø interior al cavitatii mai mari	Este de obicei forată într-o ramură moartă.	
	CV12	Intrarea în cavitate ø =4 - 7 cm cu un diametru interior al cavității mai mare	Este de obicei forată în lemn putrezit (ramură moartă, butuguă, la insertia ramurilor rupte).	
	CV13	ø > 10 cm cavitate de ciocănitoare în trunchi	De obicei forată pe partea principală a trunchiului (fără ramuri).	
	CV14	ø ≥ 10 cm găuri de hrănire, intrarea mai mare decât interiorul	Nu este perfect ovală, pare destul de dezordonată.	
	CV15	„Fluier" de ciocănitori / șir de cavități	Cel puțin trei cavități de cuibărit de ciocănitori aliniate pe trunchi. Intrarea este mai mare decât interiorul.	
Trunchi și cavități cu mucegai	CV21	ø ≥ 10 cm (contact cu solul)	Interiorul cavitatii este complet protejat de microclimatul inconjurator si de ploaie. Fundul cavității are contact cu pământul. De avut în vedere că intrarea în cavitate poate să fie mai sus pe trunchi.	
	CV22	ø ≥ 30 cm (contact cu solul)	Cavitatea din trunchiul arborelui este complet deschisă în partea superioară, adesea rezultată din ruperea tulpinii; baza cavitatii ajunge la nivelul solului, așa încât partea de jos a cavității este în contact direct cu solul.	
	CV23	ø ≥ 10 cm (fără contact cu solul)	Cavitatea trunchiului închisă în partea superioară. Partea de jos a cavității nu are contact cu solul.	
	CV24	ø ≥ 30 cm (fără conact cu solul)	adesea rezultata din ruperea tulpinii; baza cavității nu ajunge la nivelul solului, astfel încât partea de jos a cavității nu este în contact direct cu solul.	
	CV25	ø ≥ 30 cm / semideschisă/cu/fără mucegai	Camera cavitatii nu este complet protejata de microclimatul inconjurator si poate intra ploaia. Retineti ca intrarea cavitatii poate fi mai sus pe trunchi.	
	CV26	ø ≥ 30 cm /partea de deasupra deschisă	Cavitatea din trunchi este complet deschisă în partea superioară, adesea rezultată din ruperea tulpinii; baza cavității nu ajunge la nivelul solului, astfel încât partea interioară a cavității nu este în contact cu solul.	
Găuri de la ramuri	CV32	Gaura ø ≥ 10 cm	Gauri-putrede ce provin din ruperea ramurilor la nivelul trunchiului cand dezradarea lemnului de ciuperci avanseaza mai repede decat inchiderea ranii.	
	CV33	ramură goală, ø ≥ 10 cm	Spațiu gol într-o ramură mare, rezultând	
Dendrotelme și scorburi cu apă	CV41	Dendrotelm mic ø ≥ 3 cm la baza trunchiului		
	CV42	Dendrotelm mare ø ≥ 15 cm la baza trunchiului		
	CV43	Dendrotelm mic ø ≥ 5cm în coroană		
	CV44	Dendrotelm mare ø ≥ 15 cm în coroană		
Galerii de insecte și canale	CV 51	Galerie cu un singur canal mic		
	CV 52	Canale mari ø ≥ 2 cm		

Plot number	Tree number	Status	Treedata:DBH (mm)	Treedata:Height (m)	Manage	Treedata:Treecomm	CV11	CV12	CV13	CV14	CV15	CV21	CV22	CV23	CV24	CV25	CV26	CV32	CV33	CV41	CV42	CV43	CV44	CV51	CV52	IN11
38	156	V	300.0	24.3	FVF	FA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	159	V	489.0	31.5	FVF	BR	vf rupt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	160	V	828.5	38.4	FVF	FA		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	163	V	371.0	30.6	FVF	FA		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	165	V	412.5	29.9	FVF	BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	167	V	773.0	36.7	FVF	FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
38	168	V	491.5	30.8	FVF	BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	172	V	949.5	37.8	FVF	FA		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	173	V	493.5	31.9	FVF	FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0
38	174	MP	667.0	37.8		BR	T1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	3	MP	659.0	65.9		BR	gaurit ciocanit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
50	4	V	624.0	37.2		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	5	V	541.0	36.6		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	6	V	386.0	31.7		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	7	V	492.0	34.5		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
50	8	V	630.0	38.9		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	11	MP	529.0	3.5		BR	T2, ciocanit.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
50	12	V	479.0	36.7		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	13	V	544.0	38.0		BR		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
50	14	V	420.0	32.9		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	15	V	353.0	33.3		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	16	V	525.0	32.0		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	17	V	649.0	37.8		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	18	MP	373.0	3.6		BR	T2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
50	20	V	436.0	30.1		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	21	V	587.0	31.2		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	23	V	408.0	35.2		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	24	V	419.0	34.7		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	25	V	540.0	31.5		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	26	V	300.0	27.1		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	28	V	386.0	28.1		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	29	MP	546.0	6.0		BR	T2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
50	31	V	494.0	31.6		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	32	V	394.0	31.5		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	33	V	496.0	33.1		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
50	35	V	493.0	32.4		FA		0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1
50	37	V	425.0	28.0		FA		0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50	38	V	348.0	26.1		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
50	40	V	564.0	31.0		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	42	MC	366.0	7.6		BR	mort cazut	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	43	V	462.0	38.7		BR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

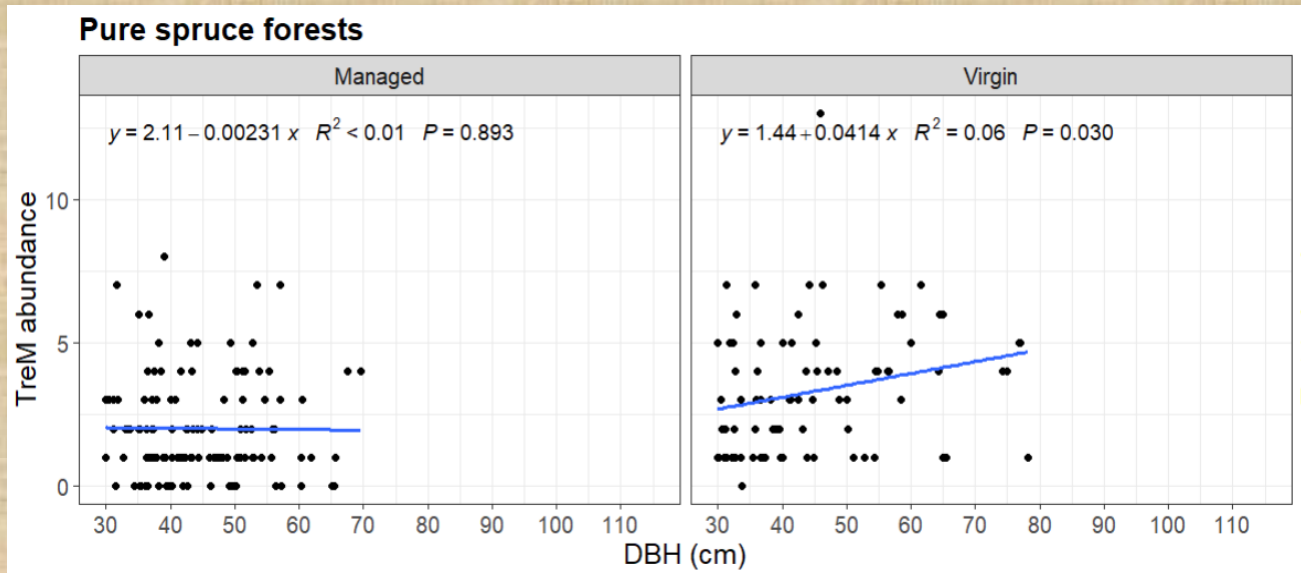
TreM abundance

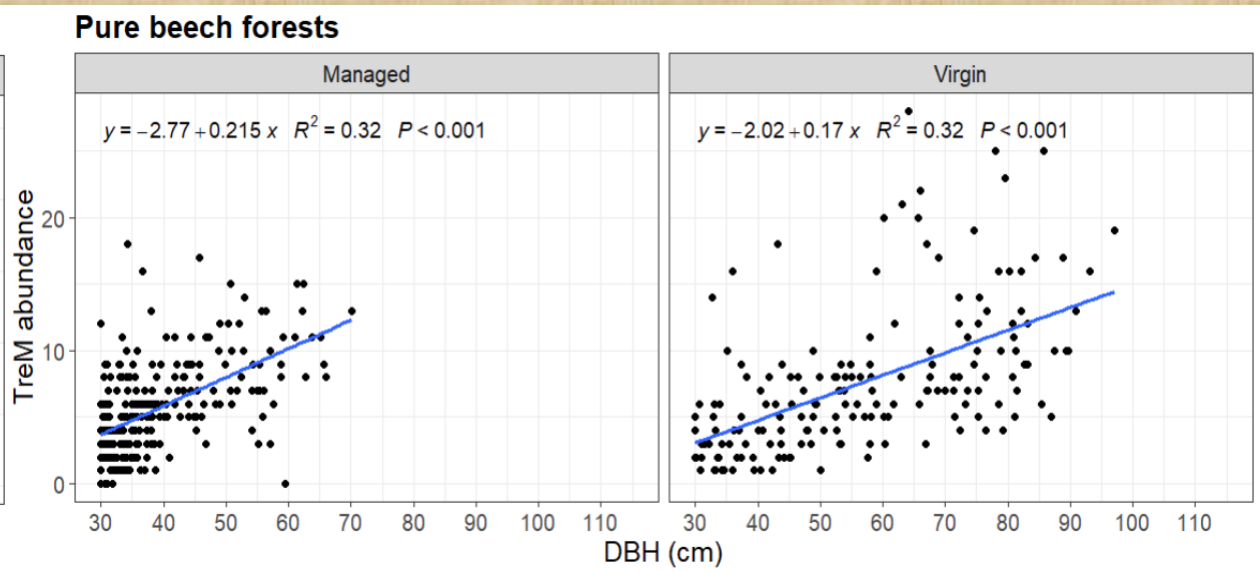


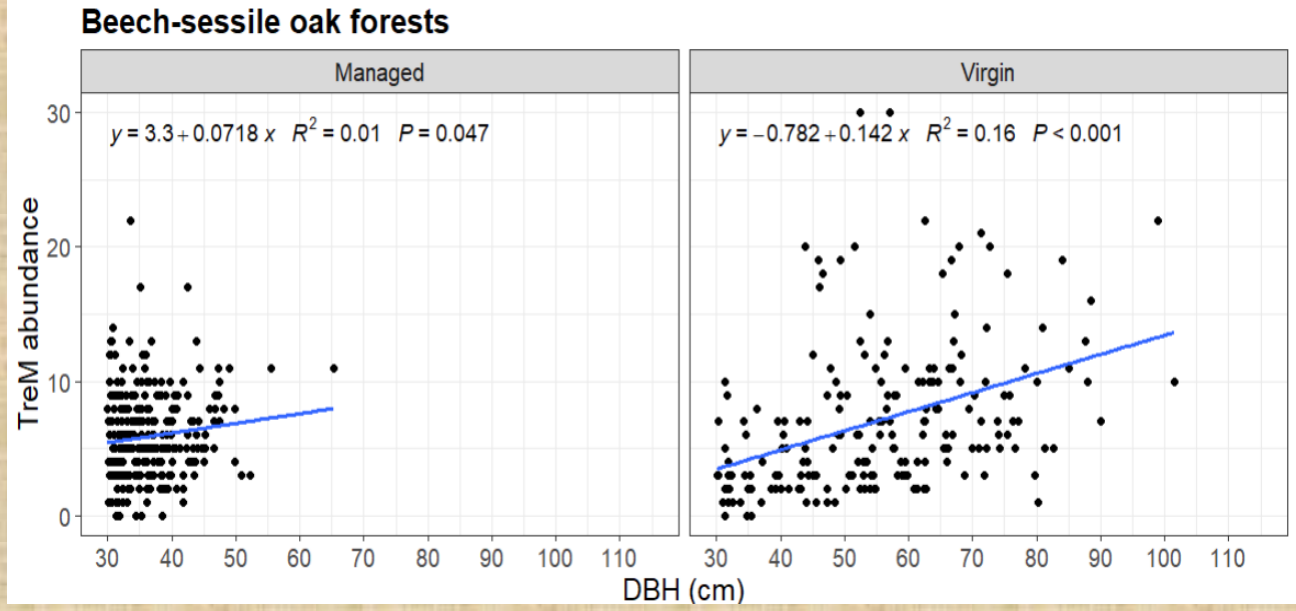
Virgin forests had more TreMs per tree than managed ones across the majority of forest types. The lowest Trem abundance was found in spruce managed forests (median 2), and the highest in Șinca's virgin mixed beech–fir forest (median 9).

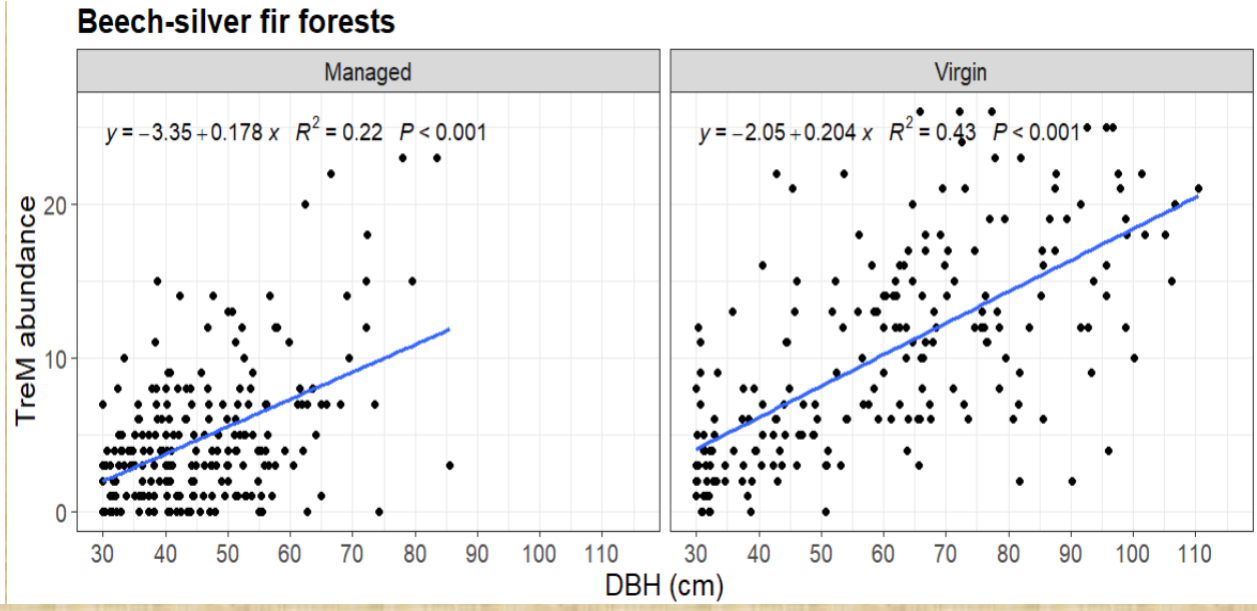
Beech and beech–oak forests were in between, with medians of 5 (managed) and 6 (virgin).

The relationship between TreM abundance and tree DBH

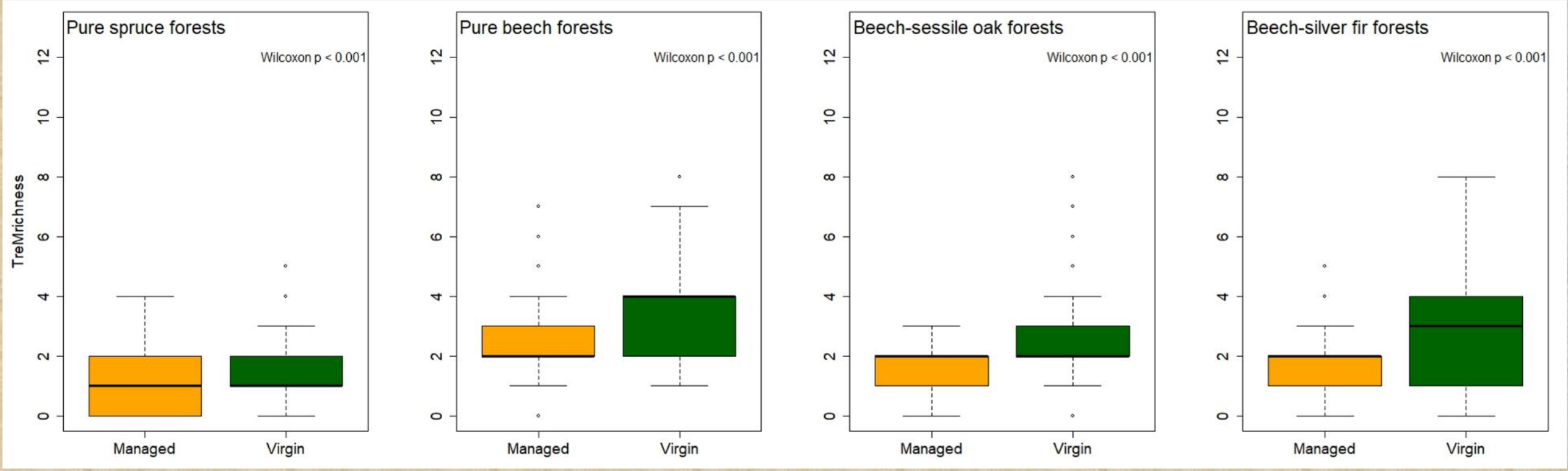








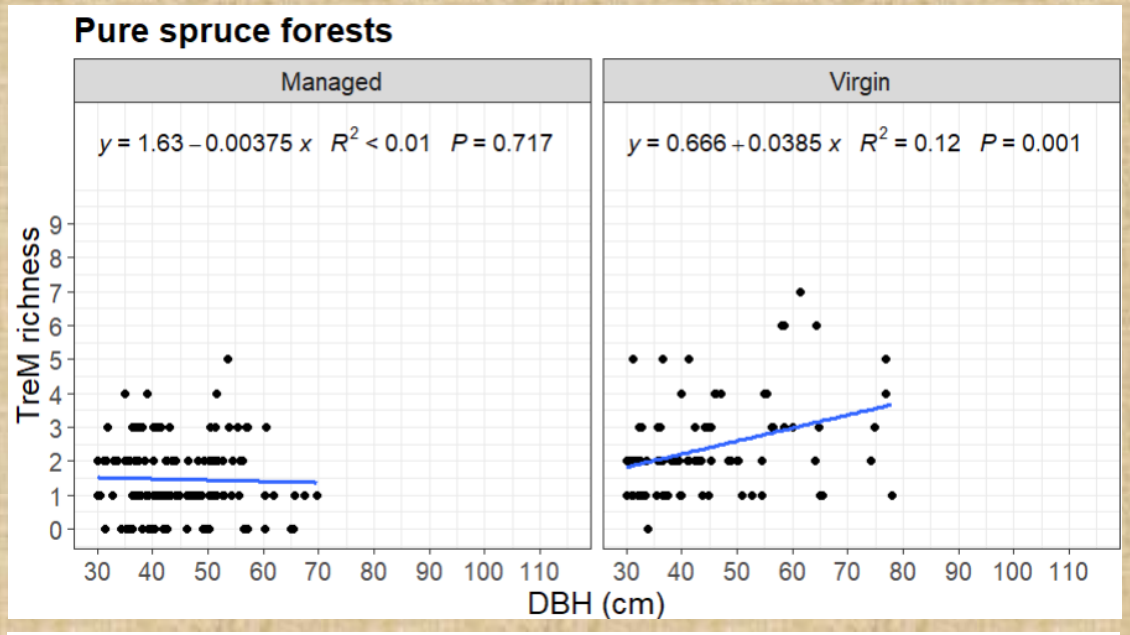
TreM richness

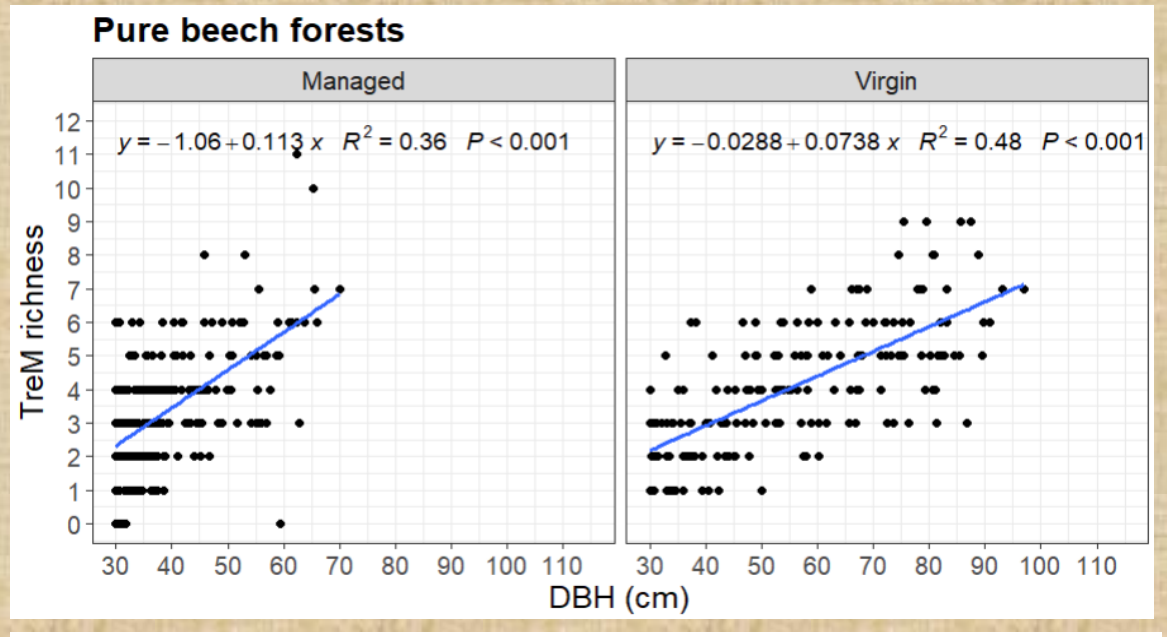


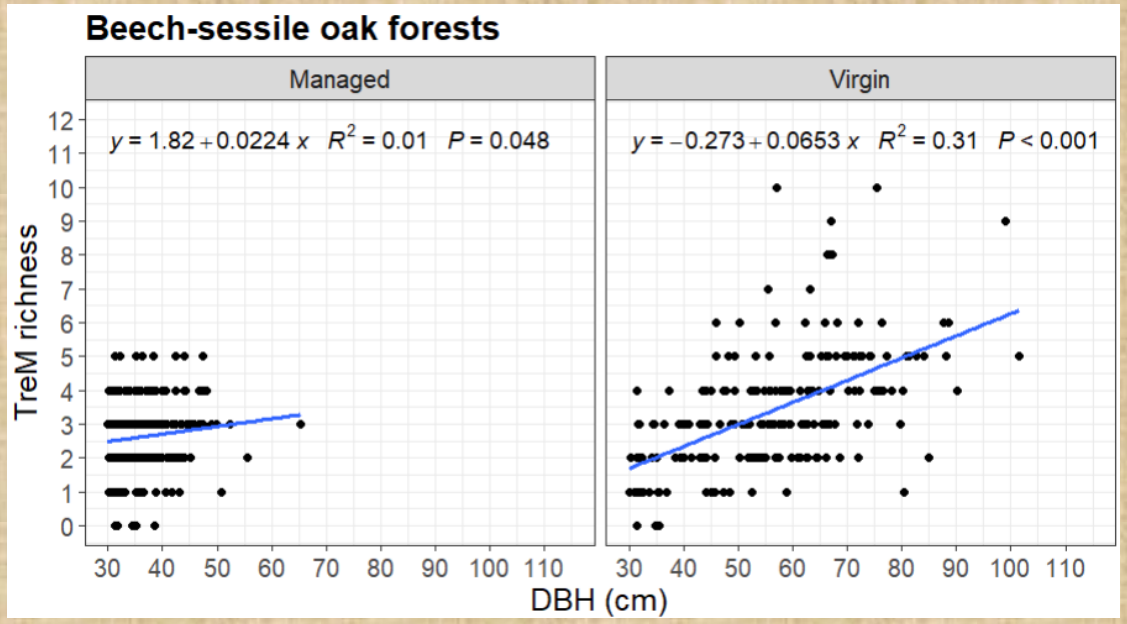
Virgin forests had significantly more different TreMs per tree (TreM richness) than managed ones across all forest types.

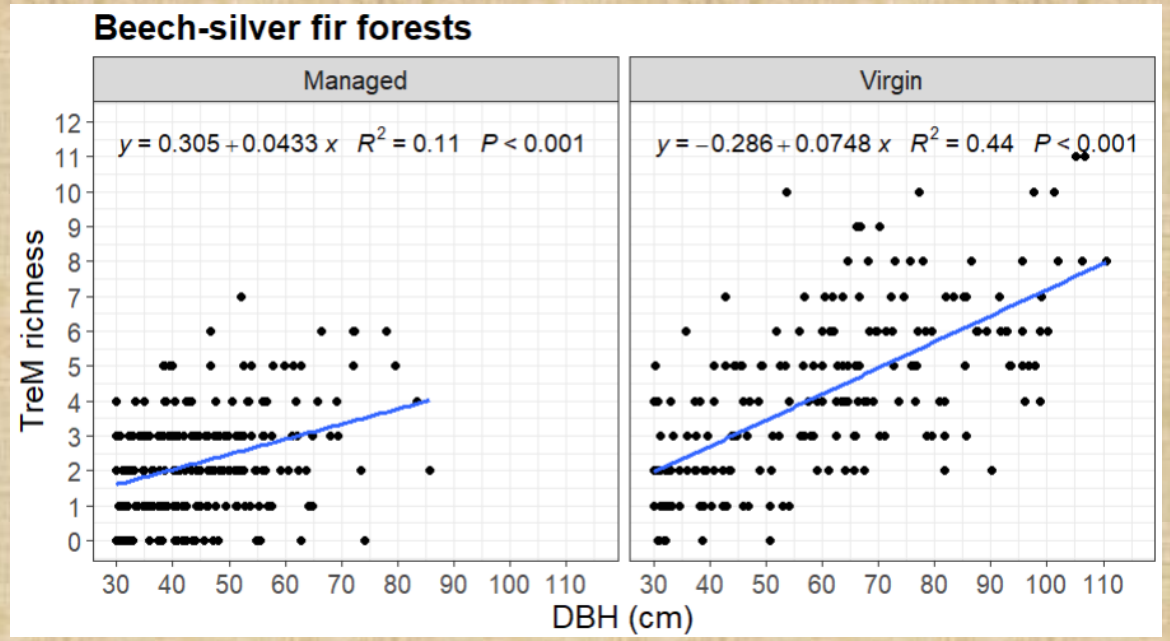
The lowest Trem richness was again found in managed spruce forests (median 1), and the highest in Șinca's virgin mixed beech–fir forest (median 3) and in virgin pure beech of Nera.

The relationship between TreM richness and tree DBH

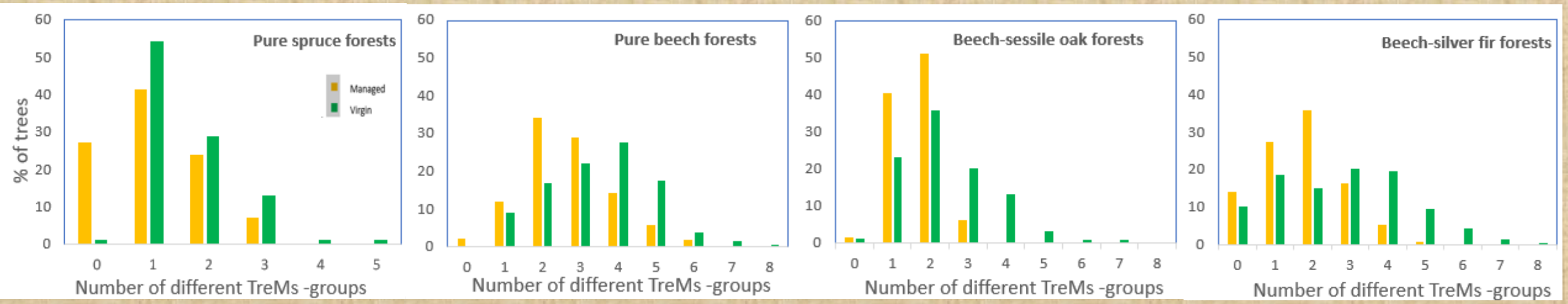








TreM richness of tree related microhabitats groups (Larrieu et al. 2018)



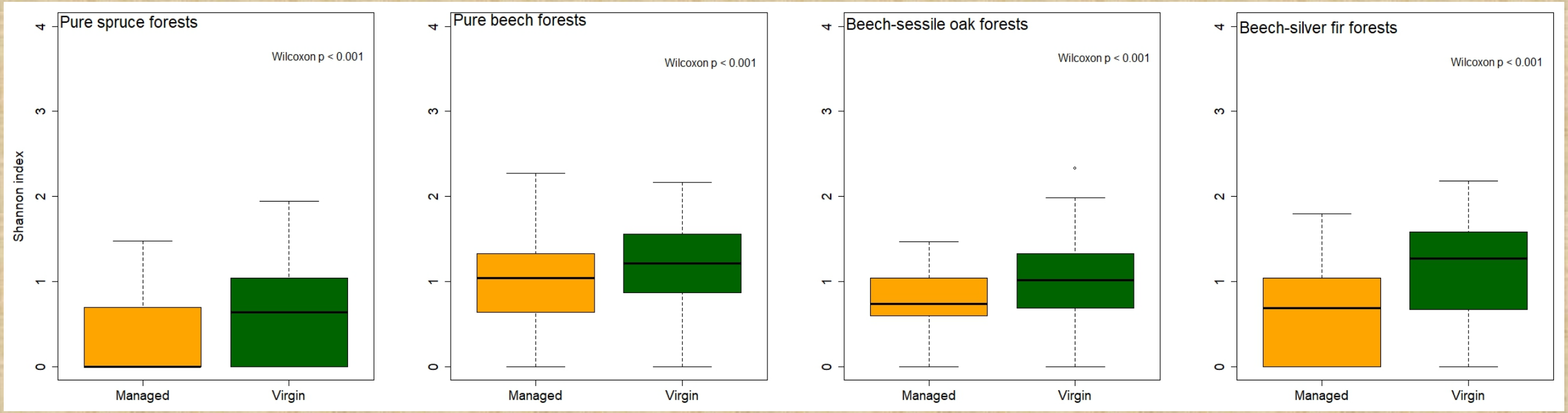
TreM richness of different groups was more left-skewed in managed forests, more trees had fewer TreM groups than in virgin forests.

Trees without TreMs were more frequent in managed forests than in virgin forests.

Virgin beech forests had trees with up to 8 TreM groups, while the trees from managed forests had maxium 6 Trems groups (in pure beech forests).

Again, the trees in spruce forests had the least number of TreM groups, with a maximum of 3 groups per tree in managed and of 5 in virgin forests, respectivelly.

TreM diversity (Shannon index)

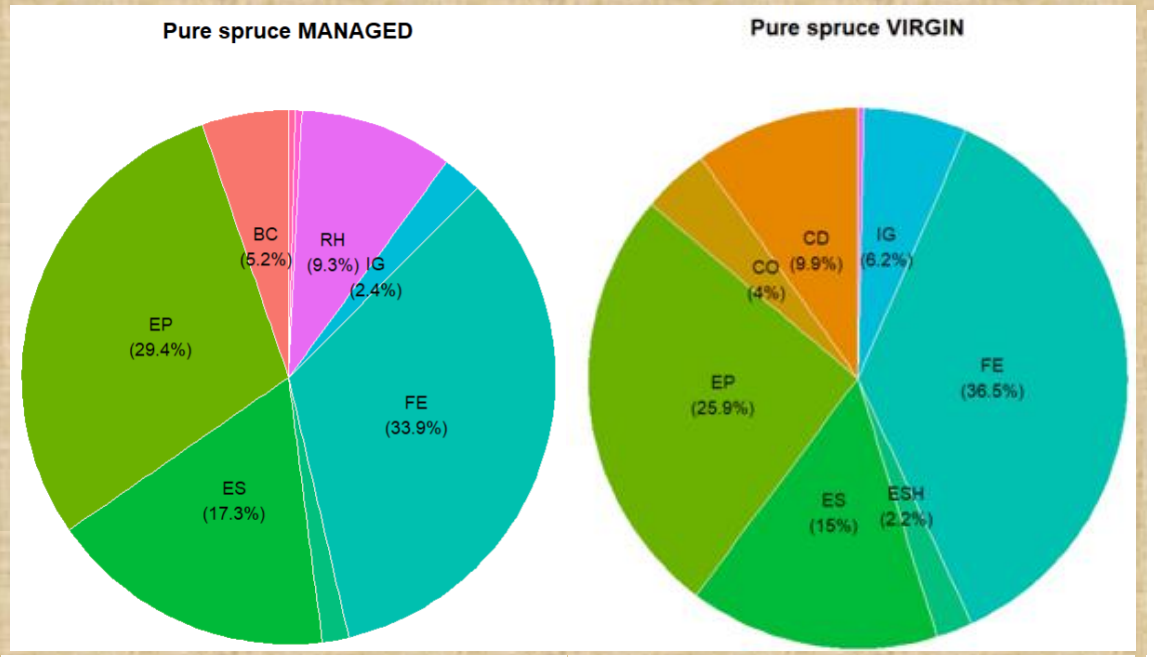


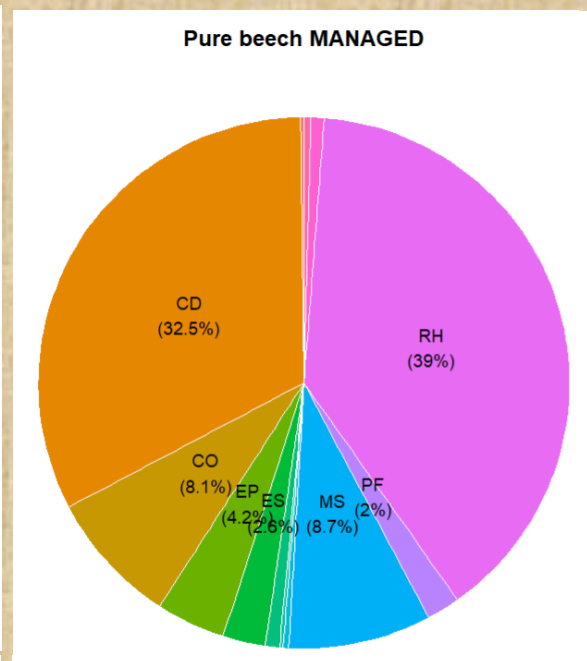
TreM diversity (Shannon index) was significantly higher in virgin forests compared to managed ones across all four forest types.

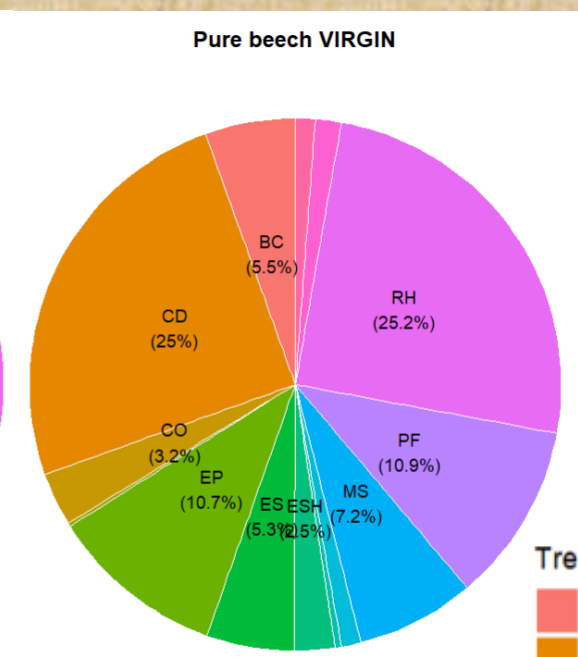
Lowest diversity was found in pure spruce forests.

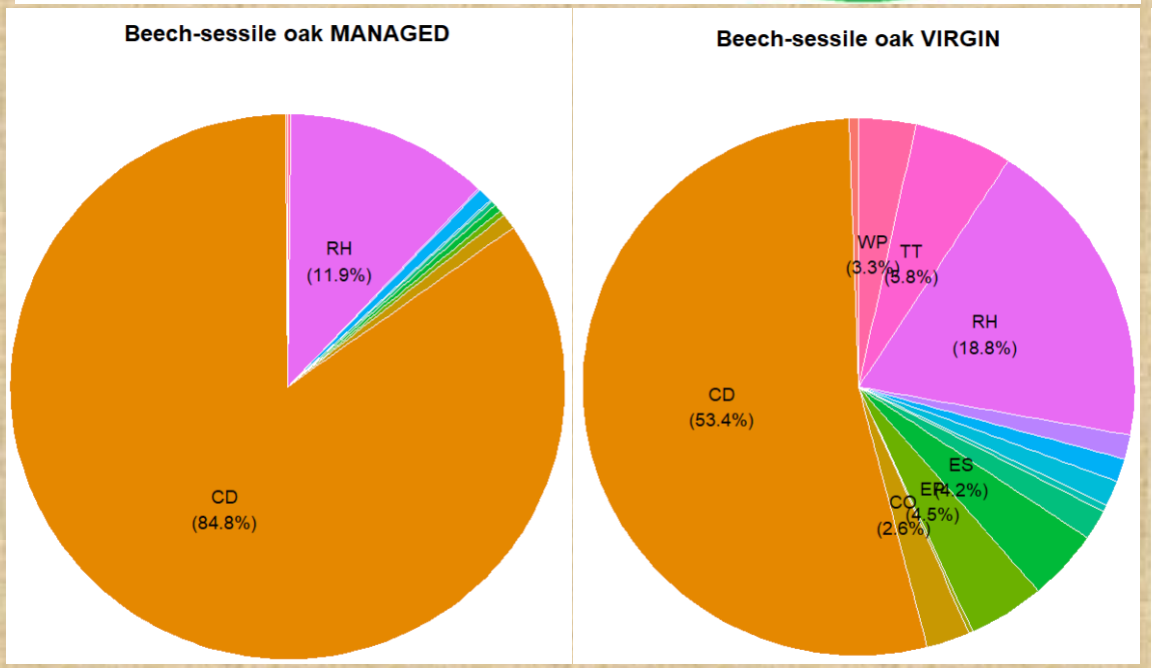
Highest diversity occurred in virgin beech–silver fir forests.

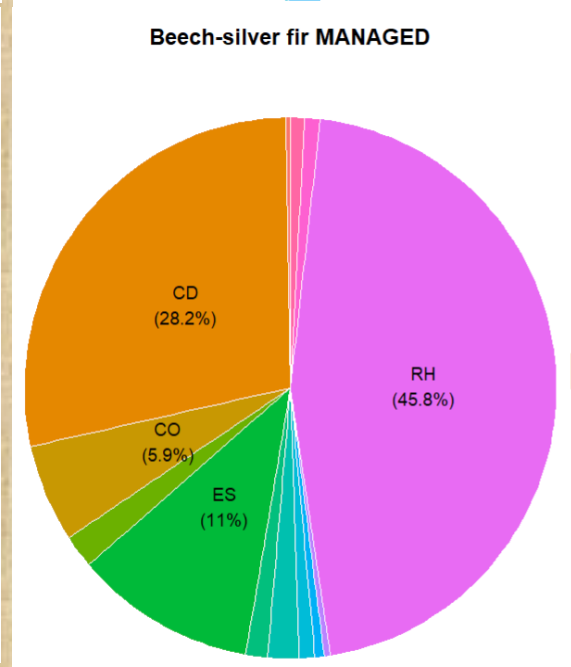
TreMs groups composition

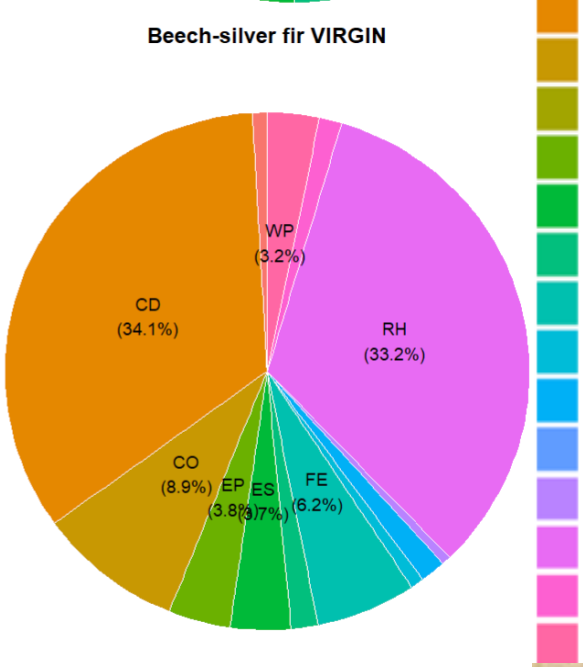


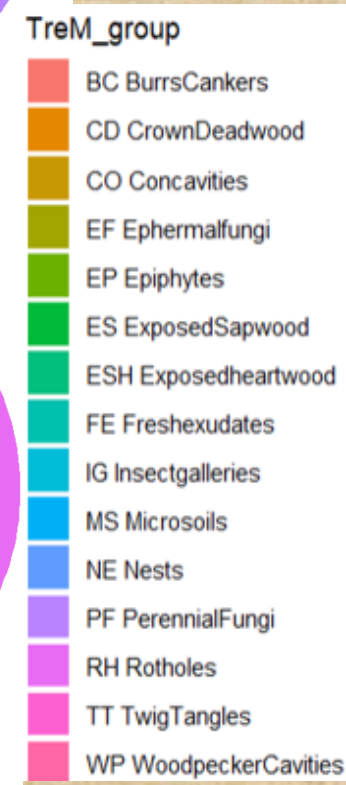












Conclusions

- **TreM patterns** are influenced by both forest type and management practices.
- **Virgin forests host a higher abundance, richness, and diversity of TreMs** than managed forests across all forest types.
- **Dominant TreM groups are similar** within forest types, but **managed forests show less structural complexity**.

Thank you for your attention!







Funding: This project was financed by the Ministry of Research, Innovation and Digitization, under the project number PN 23090301 (*Assessment of specific, structural, and functional diversity in natural forests for biodiversity protection in the context of climate change*), within the FORCLIMSOC program (Sustainable Forest Management Adapted to Climate Change and Societal Challenges

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