Vegetation types in the Central Brazilian Cerrado can be classified based on vegetation structural differences, but not on tree compositional differences

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Supplementary material

Table S1. Characteristics of the *Cerrado's* biome areas.

Cerrado's areas	Plots (n)	Plot size (m^2)	Area size (m^2)	Species Richness
Area 1	3	500	1500	28
Area 2	9	500	4500	53
Area 3	24	500	12000	60
Area 4	10	500	5000	47
Area 5	19	400	7600	36
Area 6	16	500	8000	56
Area 7	11	400	4400	26
Area 8	13	400	5200	29
Area 9	11	500	5500	51
Area 10	6	500	3000	41
Area 11	6	400	2400	15
Area 12	4	500	2000	45
Area 13	9	500	4500	54
Area 14	13	500	6500	54
Area 15	5	500	2500	43
Area 16	1	400	400	10
Area 17	2	500	1000	29
Area 18	5	400	2000	23
Area 19	1	100	100	22

Table S2. Species by hierarchical clustering of the species composition and vegetation structure and the total abundance of the tree individuals.

Families and Species	Clusters Sp. composition	Clusters Veg. structure	Total abundance
Anacardiaceae			
Astronium fraxinifolium Schott	1, 2, 3, 4	1, 2, 3	129
Astronium graveolens Jacq.	3, 4	1, 2	2
Astronium urundeuva (Allemão) Engl.	1, 2, 3	1, 2, 3	408
Lithraea molleoides (Vell.) Engl.	1, 3	1, 3	29
Schinus terebinthifolia Raddi	4	3	1
Tapirira guianensis Aubl.	1, 2, 3	1, 2, 3	398
Tapirira obtusa (Rich.) C.DC.	1	2	4
Annonaceae			
Annona bahiensis R.E. Fr.	1	2	2
Annona coriacea Mart.	1, 2, 3	1, 2, 3	14
Annona crassiflora Mart.	2, 3, 4	2, 3	13
Guatteria sellowiana A.DC.	1	3	1
Xylopia aromatica (Lam.) Mart.	1, 2, 3	1, 2, 3	368
Xylopia emarginata Mart.	2	1, 2	66
Xylopia sericea A.St.-Hil.	1, 4	1, 2, 3	215
Apocynaceae			
Aspidosperma macrocarpon Muell. Arg.	1, 3	1, 3	29
Aspidosperma parvifolium A.DC.	1, 3	1, 3	17
Aspidosperma subincanum Mart.	2	2	5
Aspidosperma tomentosum Mart.	1, 2, 3	1, 2, 3	23
Hancornia speciosa Gomes	1, 2, 3, 4	1, 2, 3	15
Aquifoliaceae			
Ilex conocarpa R. Br.	3	3	6
Araliaceae			
Dendropanax cuneatus (Benth.) Frodin	1	2	2
Didymopanax macrocarpus Rizzini	1, 3	1, 2, 3	46
Arecaceae			
Acrocomia aculeata (Jacq.) Lodd. ex Mart.	3	1, 2, 3	17
Asteraceae			
Eremanthus glomerulatus Less.	3, 4	3	10
Piptocarpha macropoda (Less.) Baker	1	1	1
Piptocarpha rotundifolia (DC.) Baker	1, 2, 3	1, 2, 3	105
Bignoniaceae			
Handroanthus albus (Cham.) Mattos	3	1	5
Handroanthus impetiginosus (Mart. ex DC.) Mattos	3	1	1
Handroanthus ochraceus (Cham.) Mattos	1	2	1
Handroanthus serratifolius (Vahl) S.O.Grose	1, 3	1, 3	11
Jacaranda caroba (Vell.) DC.	2	2	1

Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S. Moore	2	1, 2	5
Tabebuia roseoalba (Ridl.) Sandwith	3	3	1
Zeyheria montana Mart.	3	3	2
Boraginaceae			
Cordia sellowiana Cham.	1	1	6
Cordiera macrophylla Mart.	1	1	1
Cordiera sessilis (Vell.) Kuntze	2, 3	1, 2	54
Burseraceae			
Protium altissimum (Aubl.) Marchand	1, 2	1, 2	97
Protium heptaphyllum (Aubl.) Marchand	1	1	2
Calophyllaceae			
Calophyllum brasiliense Cambess.	1	2	1
Cannabaceae			
Trema micrantha (L.) Blume	2	2	1
Caryocaraceae			
Caryocar brasiliense Cambess.	1, 2, 3, 4	1, 2, 3	78
Celastraceae			
Cardiopetalum calophyllum R.S. Cowan	1, 2	1, 2	2
Salacia crassifolia (Mart. ex Schult.) G.Don	3	3	5
Chrysobalanaceae			
Hirtella glandulosa Spreng.	1	1, 2	2
Hirtella martiana Hook.f.	1	2	2
Clusiaceae			
Kielmeyera coriacea Mart.	3	3	15
Kielmeyera speciosa Mart.	3, 4	1, 3	28
Platonia insignis Mart.	3	1, 2	4
Combretaceae			
Terminalia argentea Mart. & Zucc.	1, 2, 3	1, 2, 3	68
Terminalia glabrescens Mart.	1, 3	1, 3	8
Connaraceae			
Connarus suberosus Planch.	1, 2, 3	1, 2, 3	21
Dilleniaceae			
Curatella americana L.	1, 3, 4	1, 2, 3	186
Davilla elliptica A.St.-Hil.	1, 3	1, 3	7
Ebenaceae			
Diospyros hispida A.DC.	3	1	1
Diospyros lasiocalyx Mart. ex Miq.	1, 3	1, 3	75
Erythroxylaceae			
Erythroxylum campestre A.St.-Hil.	3	3	7
Erythroxylum daphnites Mart.	3	1, 3	4
Erythroxylum deciduum A.St.-Hil.	1, 2, 3	1, 2, 3	29
Erythroxylum suberosum A.St.-Hil.	1, 2, 3	1, 2, 3	29
Euphorbiaceae			

Croton urucurana Baill.	4	1	1
Pera glabrata (Schott) Poepp. ex Baill.	1	2	6
Sapium glandulosum (L.) Morong	3	1, 3	4
Fabaceae			
Adenanthera pavonina L.	3	1, 2, 3	3
Anadenanthera colubrina (Vell.) Brenan	1, 3, 4	1, 2, 3	36
Anadenanthera peregrina (L.) Speg.	1, 3, 4	1, 3	47
Andira vermifuga (Mart.) Benth.	3	1, 3	2
Apuleia leiocarpa (Vogel) J.F. Macbr.	3	1, 2	5
Bauhinia curvula Benth.	3	1, 2	15
Bauhinia forficata Link	1, 3	1, 3	9
Bauhinia rufa (Bong.) Steud.	4	3	1
Bauhinia variegata L.	2	2	3
Bowdichia virgilioides Kunth	1, 2, 3	1, 2, 3	85
Chamaecrista orbiculata (Benth.) H.S.Irwin & Barneby	4	3	1
Copaifera langsdorffii Desf.	1, 2	1, 2	31
Dalbergia miscolobium Benth.	1, 2, 3	1, 2, 3	14
Dimorphandra mollis Benth.	1, 2, 3, 4	1, 2, 3	98
Dipteryx alata Vogel	1, 3	2	2
Enterolobium contortisiliquum (Vell.) Morong	1	3	2
Enterolobium gummiferum (Mart.) J.F. Macbr.	1, 2, 3	1, 2, 3	24
Hymenaea courbaril L.	3, 4	1, 2, 3	14
Hymenaea stigonocarpa Mart. ex Hayne	1, 3, 4	1, 2, 3	20
Hymenolobium heringerianum Ducke	1	1	12
Inga cylindrica (Vell.) Mart.	2	2	1
Inga edulis Mart.	3	1, 3	6
Inga nobilis (Vell.) Mart. ex Benth.	1	1, 2, 3	7
Leptolobium dasycarpum (Vogel) Ducasse	1, 2, 3	1, 2, 3	29
Machaerium acutifolium Vogel	1, 2, 3	1, 2, 3	13
Machaerium hirtum (Vell.) Stellfeld	1	1, 2, 3	3
Machaerium opacum Vogel	1, 2, 3	1, 2, 3	20
Mimosa claussenii Benth.	4	3	4
Mimosa hebecarpa Benth.	3, 4	1, 2, 3	28
Ormosia arborea (Vell.) Harms	2	2	5
Parkia platycephala Benth.	3, 4	1, 2, 3	19
Peltophorum dubium (Spreng.) Taub.	4	1	1
Piptadenia gonoacantha (Mart.) J.F.Macbr.	3 , 4	1, 2, 3	25
Plathymenia reticulata Benth.	1, 2, 3	1, 2, 3	107
Platycyamus regnellii Benth.	2	2	12
Platymiscium floribundum Vogel	3	3	1
Platypodium elegans Vogel	1, 3	1, 2, 3	60

Pterodon emarginatus Vogel	1, 3, 4	1, 2, 3	8
Pterodon pubescens Benth.	2	2	1
Salvertia convallariodora (Vell.) Sleumer	3, 4	1, 2, 3	47
Senegalia polyphylla (DC.) Britton & Rose	1, 3	1	6
Stryphnodendron adstringens (Mart.) Coville	1, 2, 3	1, 2, 3	52
Stryphnodendron pulcherrimum (Willd.) Hochr.	4	3	15
Tachigali aurea (Spire) Hutch.	1, 3, 4	1, 2, 3	42
Tachigali subvelutina (Mart.) G.P.Lewis & G.S.Bunting	1, 2, 3	1, 2, 3	505
Tachigali vulgaris (Benth.) Hutch.	3	1, 3	25
Vatairea macrocarpa (Benth.) Ducke	1, 3	1, 3	102
Icacinaceae			
Emmotum nitens Mart. ex Berg	1, 2, 3	1, 2, 3	293
Lamiaceae			
Aegiphila integrifolia Jacq.	2	2	1
Aegiphila verticillata Vell.	3	1, 3	12
Vitex megapotamica (Spreng.) Moldenke	3	1, 2	10
Lauraceae			
Endlicheria paniculata (Spreng.) J.F. Macbr.	2	2	7
Nectandra cissiflora Nees	3	3	5
Ocotea corymbosa Mez	3	1	1
Ocotea spixiana (Nees & Mart.) Mez	3	1	1
Loganiaceae			
Strychnos pseudoquina A.St.-Hil.	2, 3, 4	1, 2, 3	29
Lythraceae			
Lafoensia pacari A. St.-Hil.	1, 3	1, 2, 3	9
Malpighiaceae			
Byrsonima coccolobifolia Kunth	1, 2, 3	1, 2, 3	14
Byrsonima crassifolia (L.) Kunth	3	1, 3	36
Byrsonima laxiflora Griseb.	1,3	1, 2, 3	13
Byrsonima pachyphylla A.Juss.	1, 2, 3, 4	1, 2, 3	39
Byrsonima verbascifolia (L.) DC.	1, 3, 4	1, 2, 3	37
Heteropterys byrsonimifolia A.Juss.	1, 3	1, 3	15
Malvaceae			
Apeiba tibourbou Aubl.	3	1, 3	19
Eriotheca gracilipes (K. Schum.) A. Robyns	3	1	5
Eriotheca pubescens (Mart. & Zucc.) Schott & Endl.	1, 2, 3	1, 2, 3	26
Guazuma ulmifolia Lam.	1, 3	1, 2, 3	24
Luehea divaricata Mart.	4	1	1
Pseudobombax longiflorum (Mart. & Zucc.) A. Robyns	1, 3	1, 3	9

Pseudobombax tomentosum (Mart. & Zucc.) A. Robyns	2	2	2
Sterculia striata A.St.-Hil.	3	1, 2, 3	10
Melastomataceae			
Miconia albicans (Sw.) Triana	2, 3	1, 2	9
Miconia burchellii (Naudin ex Cogn.) Naudin	1, 4	1, 3	16
Miconia cuspidata (Ruiz & Pav.) D. Don	1	2	17
Miconia ferruginata DC.	3	3	45
Miconia leucocarpa (Sw.) DC.	4	3	7
Miconia rubiginosa Naudin	4	3	1
Monteverdia floribunda (A.St.Hil.) J.F.Macbr.	1	2	1
Meliaceae			
Guarea guidonia (L.) Sleumer	1, 4	2, 3	8
Guarea kunthiana A.Juss.	3	1, 3	6
Moraceae			
Brosimum gaudichaudii Trecul	3	3	1
Ficus goiana Miq.	2	2	87
Myristicaceae			
Virola sebifera Aubl.	1	1, 2	7
Myrtaceae			
Blepharocalyx salicifolius (Kunth) O.Berg	1, 2, 3	2	10
Campomanesia lineatifolia R. Br.	3	1, 2	4
Campomanesia velutina (A.St.-Hil.) O.Berg	1	1, 3	82
Eugenia dysenterica DC.	1, 2, 3	1, 2, 3	25
Eugenia florida DC.	1	2, 3	14
Myrcia splendens (Sw.) DC.	1, 3	1, 2, 3	329
Myrcia tomentosa (Aubl.) DC.	3	1	1
Psidium laruotteanum Cambess.	1, 3, 4	1, 3	41
Psidium myrsinites Mart. ex DC.	1, 2, 3	1, 2, 3	51
Psidium rufum Mart. ex O.Berg	1	1	3
Siphoneugena densiflora (O.Berg) Kausel	4	3	9
Nyctaginaceae			
Guapira graciliflora (Spreng.) Little	3, 4	3	10
Guapira noxia (Vell.) Lundell	1, 2, 4	1, 2, 3	106
Neea theifera (Planch. & Triana) Baill.	3	3	13
Ochnaceae			
Ouratea castaneifolia (Mart. ex DC.) Engl.	2	2	59
Ouratea hexasperma (A.St.Hil.) Baill.	1, 3	1, 3	19
Opiliaceae			
Agonandra brasiliensis Miers	1, 3	1, 3	5
Primulaceae			
Myrsine coriacea (Sw.) R.Br.	1, 2	1, 2	36
Myrsine gardneriana A.DC.	3	1, 2, 3	9

Myrsine guianensis (Aubl.) Kuntze	1, 3	1, 2, 3	72
Myrsine parvifolia Benth.	1	1, 2, 3	5
Myrsine umbellata Mart.	1, 3	2, 3	22
Proteaceae			
Roupala montana Aubl.	1, 2, 3, 4	1, 2, 3	61
Rhamnaceae			
Rhamnidium elaeocarpum (Rich.) DC.	1, 3	1, 2, 3	6
Rubiaceae			
Alibertia edulis (Rich.) A. Rich.	1, 3, 4	1, 2, 3	115
Coussarea hydrangeaefolia Mart.	1, 2	2, 3	3
Faramea hyacinthina DC.	4	3	1
Ferdinandusa elliptica (Poir.) Standl.	3	3	1
Guettarda viburnoides A.St.-Hil.	3, 4	1, 2	12
Palicourea rigida Kunth	1, 2, 3	1, 2, 3	7
Palicourea tetraphylla Cham.	2	2	2
Rudgea viburnoides Cham.	1, 2, 3	1, 2, 3	22
Tocoyena formosa (Cham. & Schltdl.) K.Schum.	3	1, 3	2
Rutaceae			
Zanthoxylum rhoifolium Lam.	1, 3, 4	1, 2, 3	32
Salicaceae			
Casearia sylvestris Sw.	3	1	1
Sapindaceae			
Cupania vernalis Cambess.	1	3	3
Diatenopteryx sorbifolia Radlk.	3	1, 3	5
Dilodendron bipinnatum Radlk.	1, 3	1, 2, 3	10
Magonia pubescens A.St.-Hil.	1, 3, 4	1, 2, 3	35
Matayba guianensis Aubl.	1, 2, 3	1, 2, 3	156
Sapotaceae			
Chrysophyllum marginatum (Hook. & Arn.) Radlk.	1	1, 3	14
Pouteria ramiflora (Mart.) Radlk.	1, 3	1, 3	17
Pouteria torta (Mart.) Radlk.	1, 3	1, 3	2
Simaroubaceae			
Simarouba amara Aubl.	4	2	1
Siparunaceae			
Siparuna guianensis Aubl.	1, 2	1, 2, 3	238
Solanaceae			
Solanum lycocarpum A.St.-Hil.	4	3	7
Styracaceae			
Styrax ferrugineus Nees & Mart.	1	1	12
Ulmaceae			
Plenckia populnea (Jacq.) Radlk.	1, 3	1, 2	2
Urticaceae			

Cecropia pachystachya Trécul	1, 3, 4	1, 3	15
Verbenaceae			
Physocalymma scaberrimum (DC.) Kuhlm.	3, 4	1, 2, 3	18
Vochysiaceae			
Callisthene major (Mart. ex DC.) Baill.	1, 2, 3	1, 2, 3	69
Qualea dichotoma Mart.	2, 3	1, 2	16
Qualea grandiflora Mart.	1, 2, 3, 4	1, 2, 3	359
Qualea multiflora Mart.	1, 3	1, 2, 3	9
Qualea parviflora Mart.	1, 2, 3	1, 2, 3	116
Vochysia elliptica Mart.	1, 3, 4	3	8
Vochysia rufa Mart.	1, 3	1, 3	52
Vochysia tucanorum Mart.	2	1, 2	13

Table S3. Species specific for each vegetation structural clustering, based on the 70% most abundant species.

Species		
Cluster 1	**Cluster 2**	**Cluster 3**
Anadenanthera colubrina	*Callisthene major*	*Aspidosperma macrocarpon*
Anadenanthera peregrina	*Ficus goiana*	*Byrsonima crassifolia*
Campomanesia velutina	*Guapira noxia*	*Byrsonima verbascifolia*
Diospyros lasiocalyx	*Ouratea castaneifolia*	*Caryocar brasiliense*
Guazuma ulmifolia	*Protium altissimum*	*Miconia ferruginata*
Magonia pubescens	*Siparuna guianensis*	*Psidium laruotteanum*
Myrsine guianensis	*Xylopia emarginata*	*Psidium myrsinites*
Physocalymma scaberrimum		*Qualea parviflora*
Piptadenia gonoacantha		*Stryphnodendron adstringens*
Platypodium elegans		*Vochysia rufa*
Tachigali aurea		
Terminalia argentea		
Zanthoxylum rhoifolium		

Table S4. Species specific for each species composition clustering, based on the 70% most abundant species.

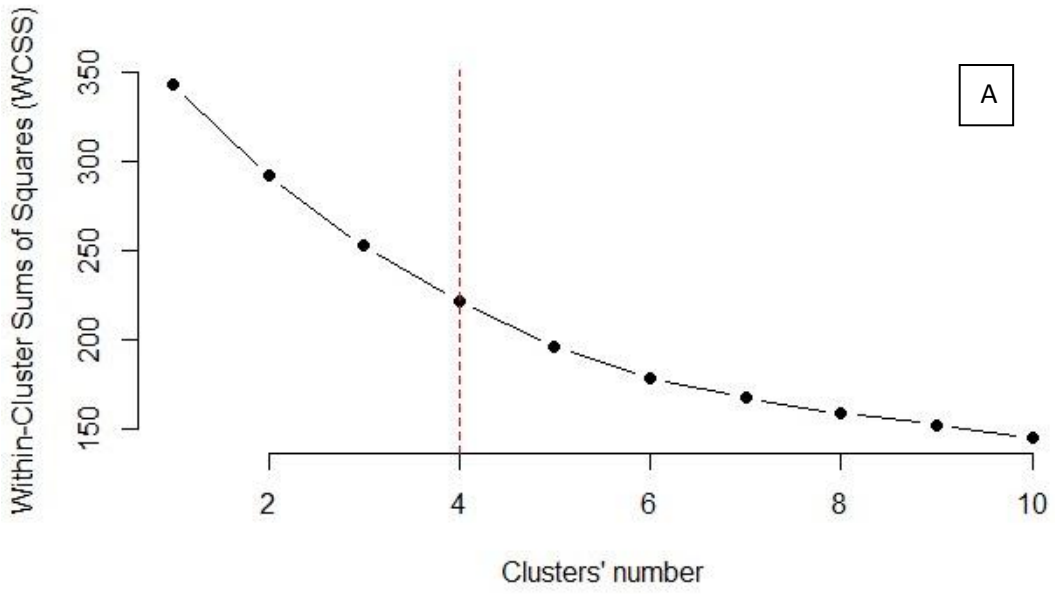
Species			
Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**
Campomanesia velutina	*Ficus goiana*	*Acrocomia aculeata*	Byrsonima pachyphylla
Matayba guianensis	*Guapira noxia*	*Anadenanthera colubrina*	Byrsonima verbascifolia
Myrcia splendens	*Protium altissimum*	*Anadenanthera peregrina*	Psidium laruotteanum
Myrsine guianensis	*Siparuna guianensis*	*Apeiba tibourbou*	Salvertia convallariodora
		Aspidosperma macrocarpon	Stryphnodendron pulcherrimum
		Astronium fraxinifolium	
		Bowdichia virgilioides	
		Byrsonima crassifolia	
		Caryocar brasiliense	
		Connarus suberosus	
		Didymopanax macrocarpus	
		Dimorphandra mollis	
		Diospyros lasiocalyx	
		Enterolobium gummiferum	
		Erythroxylum deciduum	
		Guazuma ulmifolia	
		Leptolobium dasycarpum	
		Miconia ferruginata	
		Piptocarpha rotundifolia	
		Plathymenia reticulata	
		Platypodium elegans	
		Psidium myrsinites	
		Qualea parviflora	
		Stryphnodendron adstringens	
		Tachigali vulgaris	
		Terminalia argentea	
		Vochysia rufa	

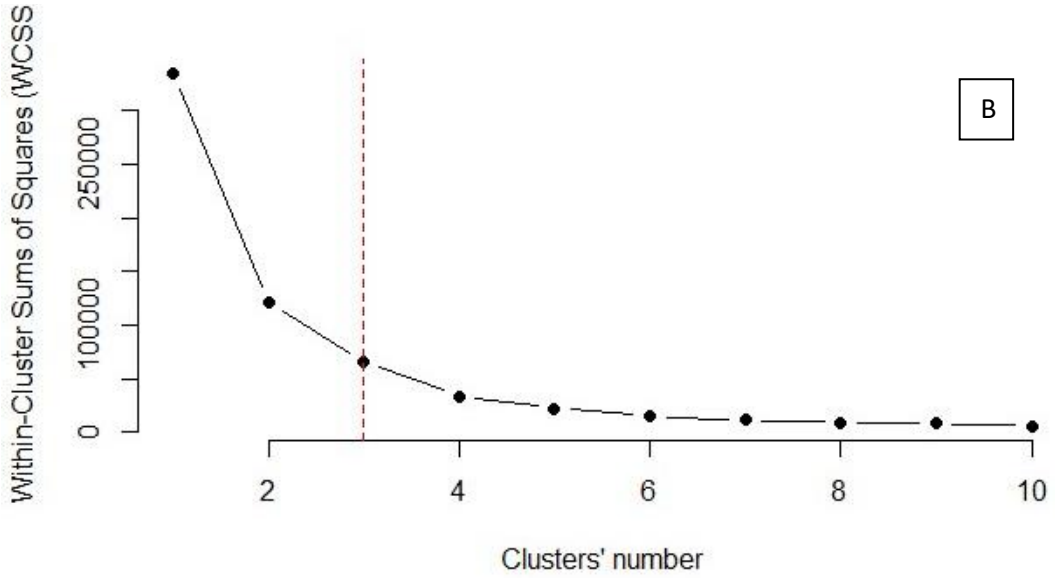
Table S5. Percentage of species shared by each species composition clustering.

Clusters	% of species shared
1	13,24
2	8,33
3	20,10
4	7,35
1, 2	2,94
1, 2, 3	14,22
1, 2, 3, 4	3,43
1, 2, 4	0,49
1, 3	14,22
1, 3, 4	6,37
1, 4	1,47
2, 3	1,96
2, 3, 4	0,98
3, 4	4,90

Table S6. Dunn test for structural vegetation and tree individual density measurements by vegetation structural clusters.

Structural measurements	Clusters	z-test Statistic	p-value	Kruskal-Wallis chi-squared	Kruskal-Wallis p-value
Maximum height (m)	1 vs 2	-3.699781	0.0006 *	137.5876	2.2E-16
	1 vs 3	7.539013	0.0000 *		
	2 vs 3	10.936260	0.0000 *		
Mean Height (m)	1 vs 2	-4.177723	0.0001 *	124.3038	2.20E-16
	1 vs 3	6.612179	0.0000 *		
	2 vs 3	10.628730	0.0000 *		
Stand basal area (m^2/ha)	1 vs 2	-3.948305	0.0002 *	53.1348	2.90E-12
	1 vs 3	3.147914	0.0049 *		
	2 vs 3	7.238300	0.0000 *		
Stand basal area < 10 cm (m^2/ha)	1 vs 2	-3.994989	0.0002 *	52.7639	3.49E-12
	1 vs 3	3.071642	0.0064 *		
	2 vs 3	7.221166	0.0000 *		
Stand basal area ≥ 10 cm (m^2/ha)	1 vs 2	-1.590390	0.3352	15.9942	0.0003364
	1 vs 3	2.290963	0.0659		
	2 vs 3	3.841472	0.0004 *		
Tree Individual Density (n/ha)	1 vs 2	-2.329223	0.0595	23.9438	0.0000
	1 vs 3	2.443391	0.0436 *		
	2 vs 3	4.800770	0.0000 *		





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197 composition, while B represents vegetation structure.