

Thematic index

Presentation	9
Tropical woody and grassy savannahs	13
1. From open forest to grassy savannah	15
1.1 Shrinking rains, growing drought	[L. Bulla, J.M. Camarasa, V. González and J. San José] 17
1.1.1 The imprecision of the concept of savannah	[J.M. Camarasa and J. San José] 17
The forest-savannah border	17
Ecotone communities and tree growth in the savannah	19
The types of savannah	19
1.1.2 Seasonal drought as the determining factor: climatic savannahs	[L. Bulla and J.M. Camarasa] 20
The tropical climatic regimes	20
Seasonality and the savannah	23
Paleoclimatic and radiometric effects	23
The climatic savannah	24
1.1.3 Geological and soil factors: soil savannahs	[V. González] 26
The effect of the soil substrate	26
The effect of fertility	27
The effect of geomorphology	28
1.1.4 The decisive role of fire	[V. González] 29
Fire and the African savannah	29
Fire in the Venezuelan savannahs	32
Fire and the Australian savannah	34
1.1.5 The influence of the fauna and the influence of humans	[V. González] 34
The action of the large herbivores	34
Human pressure	36
• <i>El Orinoco Ilustrado</i>	[J.M. Camarasa] 38
1.2 Mud in summer, dust in winter	[W. Blokhuis and B. Spiers] 42
1.2.1 Soils and savannahs, savannahs and soils	[B. Spiers] 42
The imprecise idea of the climax savannah	42
Water, nutrients, and plant growth-forms	43
1.2.2 Soil-forming factors and edaphic processes in the savannah	[W. Blokhuis] 44
Soil formation factors	44
Soil processes in the savannah area	45
1.2.3 The main soil types in the savannah	[W. Blokhuis] 48
The brown soils of arid and semiarid tropical regions	48
Ferruginous soils	48
Ferralitic soils	49
Nitisols and vertisols	49
1.2.4 The correlation between soil types and savannah types	[W. Blokhuis and B. Spiers] 51
The soils of the American savannahs	52
The soils of the African savannahs	55
The soils of the Asiatic savannahs	55
The soils of the Australian savannahs	56

1.3 The world's savannahs	[J.M. Camarasa, B. Gopal, P.B. Phillipson, G. Sarmiento, R.L. Spetch, P.A. Stott and R.J. Williams]	59
1.3.1 The American savannahs	[G. Sarmiento]	59
The Amazonian <i>caatinga</i> and the tepuys of Guyana		59
The Brazilian <i>cerradões</i> and <i>cerrado</i> and similar formations		60
The llanos of the Orinoco and the Mojos region		63
The subtropical chaco		64
The savannah formations of the Southern Cone		65
The savannahs of Central America and the Caribbean		65
1.3.2 The African and Madagascar savannahs	[J.M. Camarasa and P.B. Phillipson]	67
The Guinea savannahs		67
The Sudan savannahs		67
The savannahs of eastern Africa		69
The typical woody savannah or <i>miombo</i>		70
The South African mosaics of woody and grassy savannahs		72
Madagascar's savannahs		73
• From Verne to Saint-Exupéry	[R. Carvajal]	74
1.3.3 The savannahs of southern Asia and Malaysia	[J.M. Camarasa, B. Gopal and P.A. Scott]	81
The imprecise status of the Asian savannah		81
India's subhumid savannahs		82
The spiny forests of semiarid India		82
The savannahs of Southeast Asia		85
1.3.4 The savannahs of Australia and the Pacific	[J.M. Camarasa, R.L. Spetch and R.J. Williams]	87
The consolidated presence of the savannah in Australia		87
The woody savannahs and grassy meadows		90
The savannahs of the Pacific islands		90
2. Life in the savannah		91
2.1 The ecological functioning of the savannah	[L. Bulla, C. Fragoso, M. Haridasan, M. Lamotte, R.A. Montes, J. San José, G. Sarmiento, R.J. Scholes and R. L Spetch]	93
2.1.1 A rhythm set by the rains	[R.A. Montes, J. San José, R.J. Scholes and R.L. Spetch]	93
Climatic models		93
The indexes of moisture and sclerophyllly		94
2.1.2 Production and flows over the year	[R.A. Montes, J. San José and R.J. Scholes]	95
Biological production		95
The flow of water		100
The flow of nutrients		101
2.1.3 Root and leaf strategies to deal with water scarcity	[L. Bulla, M. Haridasan, R.A. Montes, J. San José and R.J. Scholes]	103
Competition for water resources		103
The capture and use of water		105
The tricks of herbaceous plants		106
The resources of woody plants		107
2.1.4 Phytophages, saprophages and zoophages: the consumers	[C. Fragoso, M. Haridasan, M. Lamotte, R.A. Montes, J. San José and R.J. Scholes]	108
Energy balances and flows and trophic relations		108
Phytophagy: grazers, browsers, and other herbivores		110
Saprophagy: detritus-eaters and humus-eaters		112
• Who digests the wood?	[L. Margulis]	114
Zoophagy: predators and parasites		118
2.1.5 Livestock and fire: anthropogenic savannah	[M. Lamotte, R.A. Montes, J. San José, G. Sarmiento and R.J. Scholes]	119
The effects of fire and grazing		120
Fire and functional adaptations in the savannah		122
Mineralization due to fire		124
The atmospheric transport of gases and ashes		124

2.2 The flora and the plant population	[M. Haridasan, R.A. Montes, J. San José, G. Sarmiento and R.J. Scholes]	126
2.2.1 The growth-forms	[M. Haridasan, G. Sarmiento and R.J. Scholes]	126
The typical woody plants		126
The woody plants that sprout from rootstocks, or geoxylous trees		128
Herbaceous plants		130
Palm "trees"		131
Succulent and xeromorphic plants		132
2.2.2 Functional strategies	[M. Haridasan, G. Sarmiento and R.J. Scholes]	133
Phenodynamic adaptations		133
Physiological adaptations		133
Demographic adaptations		134
2.2.3 Defenses against herbivores	[M. Haridasan, R.A. Montes, J. San José, G. Sarmiento and R.J. Scholes]	135
Thorns, poisons, and repellents		135
The seasonality of herbivory		136
2.2.4 The annual cycle	[M. Haridasan, G. Sarmiento and R.J. Scholes]	137
Rhythms and seasonality		138
The annual cycle of the woody plants		139
The graminoids over the course of the year		140
2.3 Fauna and animal settlement	[G. Halffter, B. Gopal, M. Lamotte, P.A. Scott and R.J. Scholes]	142
2.3.1 Animal adaptations to life in the savannahs	[G. Halffter, M. Lamotte and R.J. Scholes]	142
Adaptations at the individual level		142
Ethological and social adaptations		146
Demographic adaptations		150
An example of coevolution: beetles and large herbivores		151
2.3.2 Biogeographical factors and the African savannah fauna	[M. Lamotte]	154
The divergence within the fauna in the African savannah		154
The western African fauna: the cases of Comoé and Niokolo-Koba		154
The large fauna of eastern Africa: the case of Serengeti		159
• Antelopes; running and jumping	[A. Minelli]	166
The population of small vertebrates and invertebrates: the case of Lamto		176
2.3.3 The areas of distribution of the African savannah fauna	[M. Lamotte]	183
The relationship between an animal's areas of distribution and the climate and vegetation		183
• Architects and collectivists	[J. Darlington]	184
The distribution of the mammals		191
The distribution of the birds		193
The distribution of the cold-blooded vertebrates and the invertebrates		194
2.3.4 The animal population of some extreme African savannahs	[M. Lamotte]	194
The animal population of the Nimba high-altitude savannah		194
The animal population of the Nylsvley dry savannah		196
The animal population of the Fété-Olé arid savannah		197
The animal population of the hypogea environment		199
2.3.5 The South American savannah fauna	[M. Lamotte]	200
The savannah vertebrates and their areas of distribution		200
The savannah invertebrates and their areas of distribution		203
2.3.6 The Australian savannah fauna	[M. Lamotte]	203
• The strange case of the missing herbivores	[C. R. Altaba]	204
The savannah marsupials and their areas of distribution		208
The savannah birds and their areas of distribution		209
Australia's savannah insects and reptiles and their areas of distribution		210
2.3.7 The savannah fauna of Asia and Madagascar	[M. Lamotte, B. Gopal and P.A. Scott]	211
The fauna of the Indian savannoid formations		211
The fauna of the savannahs of southeast Asia		213
The savannah fauna of Madagascar		214

2.4 Life in lakes and rivers	[J. M. Camarasa, C.A. Joly, C. Ramos, G. Sarmiento, J. San José and W. D. Williams]	215
2.4.1 The waters in the savannahs	[W. D. Williams]	215
The types of water mass		215
Permanent standing freshwater		216
Temporary standing freshwater		218
Saline lakes		220
The permanent watercourses		222
Temporary watercourses		223
2.4.2 The flooded savannahs rivers	[J. M. Camarasa, C.A. Joly, C. Ramos, G. Sarmiento and J. San José]	225
• Cold-blooded killers	[A. de Sostoa and X. Ferrer]	226
The African floodable savannahs		230
The pantanal of the Paraguay River		231
Palm savannahs		232
Gallery forests		236
3. Human beings in the savannahs		237
3.1 Human settlement of the savannahs	[J.M. Camarasa, C. Junyent and O. Solbrig]	239
3.1.1 The history of the populations of the African continent	[J. M. Camarasa and C. Junyent]	239
Mitochondrial DNA and the hypothetical African Eve		239
Genetic diversity among Africans		241
The varied morphology of the Africans		242
The languages of the Africans		243
• Two-legged primates	[C. Junyent]	244
3.1.2 The population of Africa and the domestication of wild species	[J. M. Camarasa and C. Junyent]	250
The Paleolithic		250
The first Neolithic nuclei		251
From east to west and from north to south		252
The first metalworking civilizations in western Africa		254
Agriculturalists and their expansion into the forests		254
The spread of ironworking through Africa		255
The expansion of the Bantu peoples		256
The case of the Ethiopians		256
Trans-Saharan trade and the first Sudanese empires		257
The arrival of Islam		258
The Gulf of Guinea: a space not so influenced by Islam		259
The Great Lakes kingdoms and the Monomotapa Empire		260
The Portuguese route to the Indies and the Dutch route to the Cape		260
The slave trade and population loss		261
• Africans in the Americas	[C. R. Altaba]	262
European colonization and regroupment of population		267
3.1.3 The process of colonization of the savannahs	[O. Solbrig]	270
Hunter-gatherers		271
• “Doctor Livingstone, I presume”	[C.R. Altaba and R. Folch]	272
The African stockraisers and agriculturalists		276
The post-Neolithic colonization of the Indian savannahs		281
The recent colonization of the South American savannahs		281
• A World on the wane	[C.R. Altaba]	282
The recent colonization of the Australian savannahs		286
3.1.4 The human habitat in the savannahs	[O. Solbrig]	287
Traditional African architectural styles		287
The scattered dwellings of South America and Australia		289
The attraction of the cities		289
• Tents, caves, and dwellings	[C.R. Altaba and R. Folch]	290
3.1.5 Health and illness in the savannahs	[C. Junyent]	294
Trypanosomiasis		295
Cholera		296

Leprosy	297
Viral forms of hepatitis	298
Meningitis	299
• Sanitary barriers	[C.R. Altaba] 300
 3.2 The use of plant resources	[O. Solbrig] 304
3.2.1 Gathering without planting	304
Food plants	304
Medicinal and poisonous plants	305
Palms for food and other uses	306
Ornamental and fiber-producing plants	308
Coloring agents, latexes, and resins	309
• The pipe of peace	[J.M. Camarasa] 310
 3.2.2 The presents from the trees	314
The trees that are respected	315
Timber and firewood	316
 3.2.3 Large-scale grazing	319
Grazable grasslands	319
• Beautiful trees	[C.R. Altaba and R. Folch] 320
Browsing on woody species	327
 3.2.4 Agricultural activity	328
Agricultural patterns in the savannahs	328
Subsistence agriculture	330
The main crops in the savannahs: sorghum and maize	334
Plantation agriculture	336
• Wearing cotton	[J.C. Follin and J.M. Camarasa] 340
 3.3 The use of animal resources	[J.M. Camarasa and O. Solbrig] 344
3.3.1 Traditional hunting activity	344
Subsistence hunting	344
Hunting for sport	345
Nonsporting commercial hunting	346
 3.3.2 Stockraising activity	346
Cattle	347
Sheep, goats, and horses	349
Different stockraising strategies	351
• The prestige of livestock	[C.R. Altaba] 354
Nomadic pastoralism	358
Seasonal stock migration	362
Extensive sedentary stockraising	362
 3.4 Management conflicts and environmental problems	[O. Solbrig, N. Barrera-Bassols, S. Purata and W.D. Williams] 367
3.4.1 Creators of empires and victims of imperialism	[O. Solbrig, N. Barrera-Bassols and S. Purata] 367
• From Dzimbahwe to Zimbabwe by way of Rhodesia	[C.R. Altaba and R. Folch] 368
The environmental effects of the colonial process in the savannah territory	372
The case of India	373
The case of Australia	374
Contemporary tensions between production and exploitation	375
The conversion of the American tropical Mediterranean into savannahs	377
 3.4.2 From hunting and gathering to intensive agriculture	[O. Solbrig and W.D. Williams] 381
The impact of the activities of hunter-gatherers	381
The impact of extensive stockraising exploitation	382
Spontaneous or induced overgrazing	384
The impact of agricultural activity	386
The threat of erosion	387

The deterioration of the water masses	389
The impact of charcoal production and firewood extraction	389
The impact of mining activities	391
Social conflicts over land use	392
Wildlife management in Africa	394
• Tusks and horns	396
3.4.3 The condition of the urban spaces	[O. Solbrig] 400
Africa's urban diversity	400
A new form of urban development in the Brazilian <i>cerrado</i>	401
4. The protected areas and biosphere reserves in the savannahs	403
4.1 The world's protected savannahs	[C. Sharpe and J. Culverwell] 405
4.1.1 General considerations	[C. Sharpe] 405
The development of protection in the savannah areas	405
Management problems in protected savannahs	406
4.1.2 Protected parks and areas	[C. Sharpe and J. Culverwell] 407
The parks in the African and South American savannah	407
The parks in Asia's savannahs	408
The parks in the savannahs of Australia and New Guinea	412
4.2 The UNESCO biosphere reserves in the savannahs	[J.M. Camarasa, J. Culverwell, A. Rogers and C. Sharpe] 414
4.2.1 The biosphere reserves in the savannahs	[J.M. Camarasa] 414
4.2.2 The biosphere reserves in the American savannahs	[C. Sharpe] 414
The Beni Biosphere Reserve	414
4.2.3 The biosphere reserves in the African savannahs	[J. Culverwell] 420
The Serengeti-Ngorongoro Biosphere Reserve	420
4.2.4 The biosphere reserves in the southeast Asian savannahs	[A. Rogers] 427
The Komodo National Park Biosphere Reserve	427
4.2.5 The biosphere reserves in the Australian savannahs	[A. Rogers] 433
The Prince Regent River Biosphere Reserve	433
Bibliography	437
Indexes	441
Species' index	443
Thematic index	453