Peatlands and Environmental Change

. •

Dan Charman University of Plymouth, UK



JOHN WILEY & SONS, LTD

Contents

Preface and acknowledgements				
		Part 1 Introduction	1	
Chapter 1	Peat and Peatlands			
	1.1	Introduction: wetlands and peatlands	3	
	1.2	Peat and peatland definitions and terminology	3	
	1.3	Scientific classification systems	5	
	1.4	Fens and bogs: a key concept	6	
	1.5	Hydromorphological peatland classification	7	
	1.6	Mire distribution	15	
	1.7	Summary	23	
Chapter 2	Peat	24		
	2.1	Introduction: peat landforms	24	
	2.2	Landform development: form, process and time	24	
	2.3	Description of peat landforms	26	
	2.4	Landform survey techniques	28	
	2.5	Peat landform survey: an example from Scotland	32	
	2.6	Hydrology and peat landforms: the groundwater mound hypothesis	35	
	2.7	Summary	38	
		Part 2 Peatland Processes	39	
Chapter 3	Peatla	41		
-	3.1	Introduction	41	
	3.2	Hydrology and water balance	41	
	3.3	Water movement within peatlands	43	
	3.4	Outflows	49	
	3.5	Hydrochemistry	51	
	3.6	Chemical processes within peatlands	53	
	3.7	Ecology and ecohydrology	57	
	3.8	Limiting factors for plants and animals	. 57	
	3.9	Environmental gradients	60	
	3.10	Summary	72	
Chapter 4	Origins and Peat Initiation			
-	4.1	Introduction: time and peat growth	73	
	4.2	Frameworks for peat growth	73	
	4.3	Pathways to peat growth: terrestrialisation and paludification	74	
	4.4	Evidence for the origins of peatlands	79	
	4.5	Examples of peat initiation	. 80	

	4.6 4.7 4.8 4.9 4.10 4.11	Blanket mire initiation in the British Isles Causes of paludification in other mires Human impact as a cause of peat growth in other peatlands Tropical peat initiation Beavers and peat initiation Summary	80 84 86 87 90	
			51	
Chapter 5	Peat .	Accumulation	92	
	5.1	Introduction Brother d avalage and most accumulation	92	
	5.2	Preductivity	92	
	5.5	Decay	94	
	5.4	Models of peat accumulation	100	
	5.5	Variability in long-term accumulation rates	104	
	5.7	Summary	110	
		Part 3 Changes in Peatlands	115	
Chapter 6	The F	Peatland Archive: Palaeoenvironmental Evidence	117	
Chapter o	6.1	Introduction	117	
	6.2	The range of evidence and some general principles	117	
	6.3	Reasons for palaeoenvironmental studies on peatlands	120	
	6.4	Measuring time – peatland chronologies	121	
	6.5	Survey and stratigraphy	129	
	6.6	Biological evidence of past changes	130	
	6.7	Physical and chemical characteristics	137	
	6.8	Multi-proxy approaches	141	
	6.9	Summary	141	
Chapter 7	Auto	Autogenic Change		
Chapter	7.1	Introduction: long-term change	143	
	7.2	Autogenic and allogenic causes of change	143	
	7.3	Hydroseral succession	145	
	7.4	Reversals and other successions	149	
	7.5	Processes of terrestrialisation and the transition to bog peat	150	
	7.6	Lateral expansion and the development of peatland landscapes	153	
	7.7	'Mature' peatlands and erosion	155	
	7.8	Cyclic regeneration	156	
	7.9	Pattern development	156	
	7.10	Plant-mediated changes	161	
	7.11	Physical processes in cold climate peatlands	164	
	7.12	Summary	165	
Chapter 8	Allog	Allogenic Change		
·	8.1	Introduction	166	
	8.2	Climate	166	
	8.3	Fire	169	
	8.4	Hydrological factors	173	
	8.5	Volcanic influences	175	
	8.6	Climate reconstruction from peat	176	
	8.7	Summary	183	

j.

-

Chapter 9	Peatla	nd–Environment Feedbacks	184
	9.1	Introduction	184
	9.2	Catchment hydrology	184
	9.3	Water quality	186
	9.4	Peatlands and global climate	192
	9.5	Carbon budgets and gas exchange	194
	9.6	Impacts of management and climate change on carbon cycling	198
	9.7	Summary	203
		Part 4 Resource Management	205
Chapter 10	Value	207	
	10.1	Introduction: peatland values	207
	10.2	Economic values and exploitation	207
	10.3	Wildlife conservation values	209
	10.4	Functional values	210
	10.5	Value to society	210
	10.6	Conservation and 'wise use' of peatlands	210
	10.7	Impacts of recent human disturbance: drainage as a key process	212
	10.8	Peat extraction	214
	10.9	Forestry	219
	10.10	Agricultural reclamation	225
	10.11	Effects of fragmentation	226
	10.12	Pollution	227
	10.13	Recreation and other disturbance	229
	10.14	Long-term anthropogenic disturbance	229
	10.15	Summary	230
Chapter 11	Conse	231	
	11.1	Introduction	231
	11.2	Naturalness, disturbance and conservation	231
	11.3	Management options for disturbed peatlands	233
	11.4	Semi-natural peatland habitat management	234
	11.5	Restoration and rehabilitation	242
	11.6	Restoration of cutover ombrotrophic mires	244
	11.7	Restoring other damaged systems	253
	11.8	The future for peatlands in the twenty-first century	256
References			258
Index			289

.