## **CONTENTS**

Prefa	ce	v
4ckn	owledgements	vii
1.	BIODIVERSITY SCIENCE: DEFINITION, SCOPE AND CONSTRAINTS	1
	Introduction	1
	Biodiversity—Concept and Definition	1
	Scope of Biodiversity Science	4
	Constraints of Biodiversity Science	7
2.	GENETIC DIVERSITY	10
	Introduction	10
	Nature and Origin of Genetic Variations	10
	Measurement of Genetic Diversity	11
	Introduction	11
	Methods Based on DNA and Chromosomes	12
	Molecular Marker Techniques	13
	Allozyme method	13
	DNA-based marker techniques	15
	Determinants of Genetic Diversity	18
	Genetic Diversity vs Transgenic Organisms	19
3.	SPECIES DIVERSITY: WILD TAXA	20
	Introduction	20
	Species Inventory	21
	How Good Should an Inventory Be?	21
	Problems in Inventorying Species	22
	Monitoring	23
	Total Number of Species of Microbes and Plants	23
	Viruses	23
	Bacteria	23
	Fungiland Lichens	25
	Algae	25

	Bryophytes	25
	Pteridophytes	26
	Gymnosperms	26
	Angiosperms	26
	Species Diveristy	27
	History and Origin of Species Diversity	27
	Diversity Indices Based on Species	28
	Species Richness	29
	Species Abundance	29
	Taxic diversity	29
	Comparisons of Species Diversity of Different Sites	30
	Species/Area Relationships	30
	Spatial Patterns of Species Diversity	31
	Global distribution of Species Richness	32
	Distribution of Higher Plant Species Diversity	33
	Centres of Diversity	34
	Future of Species Diversity Studies	37
4.	AGROBIODIVERSITY AND CULTIVATED TAXA	39
	Introduction	39
	Origin and Evolution of Cultivated Species Diversity	39
	Introduction	39
	Act of Domestication	41
	Geography of Domestication	43
	Dispersal and Diversification	44
	Diversity in Domesticated Species	46
	Land Races	47
	Advanced Cultivars	48
	Wild Relatives of Cultivated Plants	49
	Wild Plants	50
	Feral Plants	50
	Domesticated Microbes	50
5.	ECOSYSTEM DIVERSITY	52
	Introduction	52
	Classification of Ecosystems	52
	Measuring Ecosystem Diversity	54
	Major Ecosystem Types of the World	54
	Tropical Moist Forests	54
	Temperate Forests	56
	Arid and Semiarid Ecosystems	57

		xi
	Boreal Forests	57
	Arctic and Alpine Systems	57
	Grasslands	57
	Wetland Ecosystems	60
	Freshwater Wetlands	60
	Marine Ecosystems	61
	Agroecosystems	62
	Urban and Periurban Diversity	64
	Introduction	64
	Nature of Urban Biodiversity	65
	Species Diversity in Urban Habitats	65
	Importance of Urban Biodiversity	66
6.	VALUES AND USES OF BIODIVERSITY	67
	Introduction	67
	Biodiversity Values	68
	Ethical and Aesthetic Values	73
	Precautionary Principle	74
	Methodologies for Valuation of Biodiversity	74
	Changes in Productivity Method	75
	Contingent Valuation Method	76
	Hedonic Pricing Method	76
	Travel Cost Method	76
	Uses of Plants	77
	Introduction	77
	Food	77
	Fodder and Forage	77
	Timber	78
	Rattans and Canes	78
	Medicinal Plants	78
	Ornamentals	79
	Other Uses	80
	Uses of Microbes	80
7.	LOSS OF BIODIVERSITY	81
	Introduction	81
	Loss of Genetic Diversity	11
	Introduction	11
	Factors Causing Loss of Genetic Diversity	11
	Founder Effects	11
	Demographic bottlenecks	82

	Genetic Drift	82
	Inbreeding Depression	82
	Loss of Species Diversity	83
	Introduction	83
	Processes Responsible for Species Extinction	84
	Population Size as a Critical Factor in Species Extinction	85
	Introduction	85
	MVP and Population Viability Analysis	85
	Metapopulation Concept	86
	Current and Future Species Extinction Rates	87
	Threatened Species	91
	IUCN Threatened Categories and 'Unknown' Categories	91
	Census of Threatened Species	93
	Common Features of Threatened Species	93
	Loss of Ecosystem Diversity	95
	Factors Affecting Ecosystem Degradation and Loss	95
	Loss in Diversity of Major Ecosystems of the World	97
	Tropical Forests	97
	Grasslands	97
	Inland Wetlands	98
	Coastal Ecosystems Including Mangrove System	101
	Arctic and Alpine Systems	102
	Boreal Forests	102
	Temperate Forest Systems	102
	Arid and Semiarid Lands	102
	Open Oceans	103
	Loss of Agrobiodiversity	103
	Projected Scenario for Biodiversity Loss	103
	Loss of Biodiversity as an Economic Process	104
	Conclusions	105
8.	CONSERVATION OF BIODIVERSITY	106
	Why Conservation and Conservation Biology?	106
	Current Practice in Conservation	107
	Conservation of Genetic Diversity	108
	Conservation of Species Diversity	109
	Conservation of Ecosystem Diversity	111
	Relevance of Ecosystem Diversity as well as Services in Conservation	112
	Top-down and Bottom-up Protocols for Conservation	113
	In-situ and ex-situ Conservations	113

		xiii
	In-situ Conservation	114
	Protected Areas: Introduction	115
	Biosphere Reserves and National Parks	116
	On-farm and Home Garden Conservation	123
	Ex-situ Conservation	124
	Germplasm Collections	124
	Botanic Gardens	125
	Seed banks	128
	'Test-tube' Gene Banks	130
	Pollen Banks	131
	Field Gene Banks	131
	DNA Banks	132
	In-vitro Conservation Methods	133
	Ecosystem Restoration	133
	In-situ or Ex-situ Conservation?	134
	Ex-situ Conservation of Microbes	135
	Social Approaches to Conservation	136
	Sacred Groves	137
	Sthalavrikshas	138
	People's Movements for Biodiversity Conservation	138
	Chipko Movement	138
	Chico River Dam and Tribal Campaign	139
	Participatory Forest Management	139
	Others	140
	Role of Universities and Other Educational Institutions in Biodiversity Conservation	140
	Biodiversity Awareness Programmes	140
	Biodiversity Education Resources	141
	Media	141
	Sustainable Development	142
9.	MANAGEMENT OF PLANT BIODIVERSITY	144
	Introduction	144
	Organisations Associated with Biodiversity Management	145
	Organisations Primarily Involved in Framing Policies and	
	Methodologies for Execution	145
	IUCN	145
	UNEP	146
	UNESCO	147
	WWF	149

## xiv

ICSU	149
FAO	150
CAB International	151
WCMC	151
ISBI	152
Organisations Involved in Financing Biodiversity Management	152
GEF	152
WHF	153
Biodiversity Legislation and Conventions	153
Introduction	53
International Biodiversity Laws	154
Convention on Biological Diversity	154
Trade-related Intellectual Property Rights	156
CITES	157
Ramsar Convention	159
International Undertaking on Plant Genetic resources and Farmers' Rights	159
UPOV Convention and the Rights in Plant Varietie	160
ITTA and ITTO	160
Problems Related to Legal Status of Plants	161
Plant Collection and Trade Controls	162
National Legislation	163
Biodiversity Information: Management and Communication	163
Introduction	163
Libraries	164
Bibliographies	164
Periodicals	164
Databases	164
Taxonomic Databases Working Groups for Plant Sciences SA2000	
and other Taxonomic Databases	165
Other Databases on Biodiversity	166
Distribution of Biodiversity Information	168
Metadatabases	169
Virtual Libraries	170
Special Interest Networks	170
Biodiversity Application Softwares	172
CD-ROMs and Diskettes	172
Thesauri on Biodiversity and Environment	173
Directories of Biodiversity Data Sources	173
Catalogues and Indexes of Plant and Microbial Taxa	174

	χV
10. BIODIVERSITY AND BIOTECHNOLOGY	176
Introduction	176
Biotechnology and its Role in Assessment of Biodiversity and Bioresources	176
Biotechnology and its Role in Biodiversity Conservation	177
Biotechnology and its Role in Utilisation of Biodiversity	178
Adverse Impacts of Biotechnology on Biodiversity	180
Direct Impacts	180
Indirect Impacts	182
Ecoterrorism	182
11. BIODIVERSITY PROSPECTING AND INDIGENOUS KNOWLEDGE SYSTEMS	183
Bioprospecting	183
Indigenous Knowledge Systems	184
Biopiracy	186
IPRs and Ownership of Traditional Knowledge	187
Traditional Resource Rights	188
Local Efforts to Date	189
Territorial Demarcation of Traditional Societies	189
Community Forest Management	189
Indigenous People and Protected Areas	190
Community Biodiversity Registers	190
Databases and Networks on IKS	191
Community Controlled Research	191
Centre for Farmers' Rights	191
Role of Women	192
Problems and Prospects in Participatory Management of Biodiversity	193
References	195
Glossary	223
Acronyms and Abbreviations	237
Subject Index	243
Author Index	250