

CONTENTS

1. Introduction	1
2. Tropical Population Ecology	5
I. Introduction	5
II. Recommendations for Research	7
III. Action of the Physical Environment on Organism	
Attributes	10
A. Climatic Patterns	11
B. Morphological and Physiological Response to Climate	13
IV. Population Structure and Dynamics	16
A. Numerical Properties of Population	16
1. Plant populations	16
2. Seed populations	17
3. Insect populations	18
4. Vertebrate populations	19
B. Population Structure and Patterns	20
C. Energy Budgets	22
V. Consequences of Population Interactions	26
A. Competition	26
B. Predation, Parasitism, and Disease	27
C. Mutualism	29
VI. Community Consequences of Population Interaction	31
A. Patterns of Species Diversity	31
B. Phenological Structure of Communities	34
C. Patterns of Energy Flow	34
VII. Pest Population Management	37
A. Management Strategies in Agroecosystems	37
B. Management Strategies for Forest Pests	42
C. Management Strategies for Animal and Human Diseases	45
3. Tropical Ecosystem Structure and Function	67
I. Introduction	67
II. Recommendations for Research	68
III. State of Knowledge	73

A. Structure of Terrestrial Systems	73
B. Function of Terrestrial Systems	78
1. Productivity	78
2. Mineral cycling	82
3. Phenology	84
4. Role of animals in ecosystems	86
C. Fresh-Water Systems: Structure and Function	87
1. Stratification and nutrient cycling in lakes	88
2. Comparison of tropical and temperate lakes	89
3. River systems	90
4. Management of freshwater systems	93
D. Coastal Marine Ecosystems	95
E. Modeling Tropical System	97
IV. Emerging Principles	98
A. Primary Productivity	98
B. Mineral Cycling	99
C. Predictability of the Environment	99
D. Environmental and Internal Controls of Ecosystems	100
E. Optimization and Maximization	100
F. Regional Coupling Mechanisms	101
G. Modeling and System Analysis	102
4. Recovery of Tropical Ecosystems	113
I. Introduction	113
II. Recommendation for Research	116
III. Existing Knowledge and Lacunae	117
A. Major Factors Initiating Succession	118
B. A Description of Successional Processes	120
C. Interaction of Successional Components	125
1. Effect of the environment	125
2. Influence of the biota on succession	126
3. Plant-plant interactions	127
4. Animal-plant interactions	127
5. Role of autecology in understanding succession	129
6. Edaphic aspects of secondary succession	131
5. Interaction of Man and Tropical Environments	139
I. Introduction	139
II. Recommendations for Research	141
III. Evaluation of Ecological Determinants	145
IV. Agriculture and Livestock	149
A. Research on Agricultural Systems	150
B. Conservation of Soil Structure	155

C. Climatic Effects on Organisms and Processes	156
D. Plant Protection	157
E. Biological Nitrogen Fixation	158
F. Mycorrhiza in Tropical Ecosystems	159
V. Utilization of Forests	160
VI. Utilization of Native Animals	162
A. Subsistence Hunting and Fishing	162
B. Commercial Hunting and Fishing	163
C. Human Alteration of Animal Habitats	164
D. Wildlife for Tourism and Sport Hunting	165
VII. Selected Industrial and Developmental Activities	166
A. Hydrological Projects	166
1. Fishery research	167
2. Water-borne disease	168
3. Aquatic weeds	170
4. Watershed management	170
5. Recreation and tourism	172
6. Human resettlement problems	173
7. Irrigation projects	174
B. Transportation	174
C. Mining	175
D. Tourism	177
6. <i>Impacts of Regional Changes on Climates and Aquatic Systems</i>	183
I. Introduction	183
II. Recomendations for Research	185
III. Ecological Impact of Technology on Aquatic Ecosystems	190
A. Biogeochemical Relationships	190
B. Effects of Altered Water Regimes	192
1. Changes in flow	192
2. Changes in salinity	193
3. Thermal loading	193
4. Suspended material	194
5. Naturally occurring compounds	196
6. Alien pollutants	197
IV. Tropical Diseases as Ecological Systems	202
V. Impact of Technology on Climate	205
A. Interregional Atmospheric Processes	205
B. Deliberate Weather Modification	206
C. Global Climate Change	208
1. Factors affecting the climate	208
2. Man's activities in the tropics that might affect climate	210
3. Atmospheric oxygen: a nonproblem	217

D. Synthetic Climatic Statistics as Ecological Predictions	217
7. Mechanisms to Support and Encourage Research and Education in Tropical Ecology	225
I. Introduction	225
II. Recommendations	227
III. Present Status of Ecological Research in the American Tropics	229
A. Comments on the Establishment of Multinational Programs	230
B. Analysis of Past Efforts of Foreign Studying Tropical Areas	231
IV. Education	233
A. Present Status of Educational Programs in Ecology in the American Tropics	233
B. International Cooperation	233
V. Documentation and Information in Tropical Ecology	234
Appendix 1	235
Appendix 2	237
Index	239
8. Recovery of Tropical Ecosystems by Human Activities	240
I. Introduction	243
II. Recommendations for Research	245
III. Relation of Knowledge and Information to Rehabilitation	247
A. Major Factors	247
B. A Description of Successional Stages	248
C. Interaction of Successional Stages	250
1. Effect of human activities on the flora	250
2. Influence of the flora on human beings	256
3. Plant-plant interactions	257
4. Animal-plant interactions	257
5. Role of entomology in rehabilitation	259
6. Ecological aspects of reforestation	261
D. Ecological Diseases as Ecosystem Diseases	271
IV. Recovery of Man and Tropical Ecosystems	279
A. Introduction	280
B. Recommendations	281
C. Evaluation of Ecological Diseases	285
D. Agriculture and Livestock and Soil Erosion	287
A. Rehabilitation/Restoration of Soil Erosion	287
B. Conservation of Soil Structure and Soil Fertility	288