

# Contents

## Preface 19

- 1 Anthropogenic impacts on the natural environment of the southern Moravia landscape, 23
  - 1.1 The landscape of southern Moravia (F. Vašíček), 25
    - 1.1.1 References, 27
  - 1.2 Air pollution (P. Hadaš and F. Vašíček), 29
    - 1.2.1 References, 32
  - 1.3 The hydrological regime and pollution of waters (E. Kočková and P. Hadaš), 33
    - 1.3.1 The hydrological characteristics, 33
    - 1.3.2 Chemical status of the watercourses, 42
    - 1.3.3 Pollution and chemical status of the Nové Mlýny reservoirs, 45
    - 1.3.4 References, 50
  - 1.4 The quality of underground water (P. Hadaš), 51
    - 1.4.1 References, 54
  - 1.5 The technical hydroengineering and land reclamation works (F. Vašíček), 55
    - 1.5.1 References, 59
  - 1.6 Changes in the use of agricultural land (F. Vašíček), 61
    - 1.6.1 References, 63
  - 1.7 The impact of water withdrawal in the floodplain forest (F. Vašíček), 65
    - 1.7.1 References, 67
- 2 The research locality (F. Vašíček), 69
- 3 Abiotic factors after the change of moisture regime in the forest ecosystem, 73
  - 3.1 The meteorological conditions in southern Moravia following the control of flooding in the floodplain forests (F. Vašíček and J. Pivec), 75
    - 3.1.1 References, 80

- 3.2 Light conditions in the floodplain forest (F. Vašíček), 81
- 3.2.1 Introduction, 81
  - 3.2.2 Methods, 81
  - 3.2.3 Results and discussion, 83
  - 3.2.4 Summary, 94
  - 3.2.5 References, 96
- 3.3 The microclimate of the floodplain forest (F. Vašíček and J. Pivec), 97
- 3.3.1 The aim of the work, 97
  - 3.3.2 Methods, 97
  - 3.3.3 Results and discussion, 97
  - 3.3.4 Summary, 101
  - 3.3.5 References, 101
- 3.4 Actual and potential evapotranspiration in the floodplain forest (V. Židek), 103
- 3.4.1 Introduction, 103
  - 3.4.2 Material and methods, 103
    - 3.4.2.1 Measurement, instrumentation and data processing, 104
    - 3.4.2.2 The determination of the actual evapotranspiration by the energy (thermal) balance method, 106
    - 3.4.2.3 Determination of the potential evapotranspiration, 107
  - 3.4.3 Results and discussion, 109
    - 3.4.3.1 The course and daily totals of the latent heat flow and other components of the equation of thermal balance, 109
    - 3.4.3.2 Comparison of the values of the actual evapotranspiration (from the equation of thermal balance) with values of potential evapotranspiration, 115
  - 3.4.4 Conclusion, 118
  - 3.4.5 References, 119
- 3.5 Atmospheric pollution at the Lednice na Moravě research site (R. Mrkva), 121
- 3.5.1 Introduction, 121
  - 3.5.2 Methods, 121
  - 3.5.3 Results, 122
    - 3.5.3.1 Emissions of SO<sub>2</sub> in the vicinity of the research area, 122
    - 3.5.3.2 The emissions of dust fallout, 122
    - 3.5.3.3 Fly ash, 123
    - 3.5.3.4 Concentration of SO<sub>2</sub> and SO<sub>x</sub>-S, 123
  - 3.5.4 Discussion, 124
  - 3.5.5 Summary, 125
  - 3.5.6 References, 125
- 3.6 Changes in the water table (A. Prax), 127
- 3.6.1 Introduction, 127
  - 3.6.2 Measuring methods, 127
  - 3.6.3 Results and discussion, 128
  - 3.6.4 Conclusion, 130
  - 3.6.5 References, 131
- 3.7 Recent soil processes in the floodplain forest (B. Grunda, A. Prax and E. Klimo), 133
- 3.7.1 Introduction, 133

- 3.7.2 Materials and methods, 133
  - 3.7.3 Results and discussion, 134
    - 3.7.3.1 Changes in the input of nutrients to the ecosystem following flood control measures, 134
    - 3.7.3.2 Changes in the moisture regime of the soils, 135
    - 3.7.3.3 Changes in the physical properties of the soils, 135
    - 3.7.3.4 The oxidation-reduction conditions of the soil, soil reaction, 136
    - 3.7.3.5 Changes in humus, carbon and nitrogen content of the soil, 137
  - 3.7.4 Summary, 140
  - 3.7.5 References, 140
- 4 Changes of structures and processes in the ecosystem of the floodplain forest in the medium moisture gradient under the influence of changes in moisture conditions, 143
- 4.1 The hydrophysical properties of the soil and changes in them (A. Prax), 145
    - 4.1.1 The aim of the work, 145
    - 4.1.2 Material and methods, 145
    - 4.1.3 Results and discussion, 146
      - 4.1.3.1 Changes in the dynamics of the water table, 146
      - 4.1.3.2 Changes in the dynamics of the soil moisture content, 149
      - 4.1.3.3 Changes in the physical properties of the soil, 162
    - 4.1.4 Summary, 167
    - 4.1.5 References, 168
  - 4.2 The processes of decomposition of organic matter (B. Grunda), 169
    - 4.2.1 Introduction, 169
    - 4.2.2 Material and methods, 169
    - 4.2.3 Results, 171
      - 4.2.3.1 The structure and number of microbial decomposers – microphytoedaphons, 171
        - 4.2.3.1.1 The cultivation plate methods, 171
        - 4.2.3.1.2 The ammonifying microorganisms, 173
        - 4.2.3.1.3 Organisms binding atmospheric nitrogen, 174
        - 4.2.3.1.4 Sulphate-reducing bacteria, 175
        - 4.2.3.1.5 Cellulose decomposers, 175
        - 4.2.3.1.6 Polyphenoloxidase producers, 177
        - 4.2.3.1.7 Microscopy methods, 177
        - 4.2.3.1.8 Microbial biomass, 179
        - 4.2.3.1.9 The seasonal production of microorganisms, 180
      - 4.2.3.2 The decomposition of cellulose, 181
        - 4.2.3.2.1 Laboratory test, 181
        - 4.2.3.2.2 Field test, 181
      - 4.2.3.3 The decomposition of litter, 182
        - 4.2.3.3.1 The energy reserves, 185
      - 4.2.3.4 Activity of soil catalase, 186
      - 4.2.3.5 Soil respiration, 186
        - 4.2.3.5.1 The laboratory test, 187
        - 4.2.3.5.2 The field test, 187
      - 4.2.3.6 Ammonification and nitrification, 190
        - 4.2.3.6.1 Ammoniacal nitrogen, 190
        - 4.2.3.6.2 Nitrate nitrogen, 191

- 4.2.4 Summary, 192
- 4.2.5 References, 194
- 4.3 Changes in the structure and biomass of the herb layer under the conditions of a medium moisture gradient (F. Vašíček), 197
  - 4.3.1 The aim of the work, 197
  - 4.3.2 Material and methods, 197
  - 4.3.3 Results, 199
  - 4.3.4 Summary, 225
  - 4.3.5 References, 227
- 4.4 The reaction of the shrub layer (F. Vašíček), 229
  - 4.4.1 Introduction, 229
  - 4.4.2 Methods, 229
  - 4.4.3 Results and discussion, 230
  - 4.4.4 Summary, 242
  - 4.4.5 References, 242
- 4.5 The tree layer (M. Vyskot), 243
  - 4.5.1 Introduction, 243
  - 4.5.2 Methods, 243
  - 4.5.3 Results, 245
    - 4.5.3.1 Basic data for 1970–84, 245
    - 4.5.3.2 Analysis of dead trees, 249
    - 4.5.3.3 Evaluation of the diameter increment, 251
    - 4.5.3.4 Litter, 257
  - 4.5.4 Summary, 261
  - 4.5.5 References, 263
- 4.6 Model of the organic matter flow in a representative ecosystem of the floodplain forest (M. Palát), 265
  - 4.6.1 Introduction, 265
  - 4.6.2 Methods, 265
  - 4.6.3 Results, 267
  - 4.6.4 Discussion, 275
  - 4.6.5 Summary, 276
  - 4.6.6 References, 277
- 5 Analysis of environmental conditions and vegetation gradients in the area of floodplain forests, 279
  - 5.1 Types of dominance of the herb layer associated with moisture gradients soon after changes in the moisture regime (P. Vašíček), 281
    - 5.1.1 Material and methods, 281
    - 5.1.2 Results, 283
      - 5.1.2.1 The biomass of species according to their ecological groups and in relation to soil moisture, 283
      - 5.1.2.2 Types of dominance and the moisture gradient, 289
    - 5.1.3 Summary, 292
    - 5.1.4 References, 293

- 5.2 Selected degrees of the soil moisture gradient and the characteristics of primary producers, 295
  - 5.2.1 The dynamics of soil moisture in areas with various moisture gradients (A. Prax), 295
    - 5.2.1.1 Introduction, 295
    - 5.2.1.2 Methods, 295
    - 5.2.1.3 Results, 296
    - 5.2.1.4 Discussion, 307
    - 5.2.1.5 Summary, 308
  - 5.2.2 Seasonal changes in the structure and production parameters of five selected types of dominance of the herb layer (F. Vašíček), 309
    - 5.2.2.1 Introduction, 309
    - 5.2.2.2 Methods, 309
    - 5.2.2.3 Results and discussion, 310
      - 5.2.2.3.1 Changes in above-ground biomass, 310
      - 5.2.2.3.2 Seasonal changes in the dead and dying matter of the herb layer, 317
      - 5.2.2.3.3 Seasonal changes in leaf fall on the soil surface, 320
    - 5.2.2.4 Summary, 321
    - 5.2.2.5 References, 322
  - 5.2.3 The dynamics of diameter increment of trees under different moisture conditions (M. Vyskot), 323
    - 5.2.3.1 The aim of the work, 323
    - 5.2.3.2 Methods, 323
    - 5.2.3.3 Results and discussion, 325
    - 5.2.3.4 Conclusion, 333
    - 5.2.3.5 References, 333
- 5.3 Direct and indirect analyses of the environment and herb vegetation gradients, 335
  - 5.3.1 Soil moisture content in connection with topography (A. Prax), 335
    - 5.3.1.1 Introduction, 335
    - 5.3.1.2 Material and methods, 335
    - 5.3.1.3 Results and discussion, 336
      - 5.3.1.3.1 The Lednice transect, research area 6, 336
      - 5.3.1.3.2 The Moravská Nová Ves transect, research area 7, 341
      - 5.3.1.3.3 The Raňšpurk transect, research area 8, 347
    - 5.3.1.4 Summary, 353
    - 5.3.1.5 References, 354
  - 5.3.2 Changes in the herbal vegetation along the topographical moisture gradient (F. Vašíček), 355
    - 5.3.2.1 Introduction, 355
    - 5.3.2.2 Material and methods, 355
    - 5.3.2.3 Results, 357
      - 5.3.2.3.1 The Lednice transect, research area 6, 357
      - 5.3.2.3.2 The Moravská Nová Ves transect, research area 7, 365
      - 5.3.2.3.3 The Raňšpurk transect, research area 8, 372
    - 5.3.2.4 Discussion, 382
    - 5.3.2.5 Summary, 384
    - 5.3.2.6 References, 385
  - 5.3.3 Indirect gradient analysis (J. Viewegh), 387
    - 5.3.3.1 Introduction, 387

- 5.3.3.2 Materials and methods, 387
  - 5.3.3.3 Results, 387
  - 5.3.3.4 Summary, 392
  - 5.3.3.5 References, 392
- 6 Water relations of floodplain forest primary producers, 395
- 6.1 Water consumption of full-grown oak (*Quercus robur* L.) in a floodplain forest after the cessation of flooding (J. Čermák, J. Kučera and M. Štěpánková), 397
    - 6.1.1 Introduction, 397
    - 6.1.2 Environmental conditions, 397
    - 6.1.3 Material and methods, 399
    - 6.1.4 Results and discussion, 401
      - 6.1.4.1 Seasonal and diurnal dynamics of transpiration flow in trees, 401
      - 6.1.4.2 Dependence of transpiration flow on meteorological conditions, 404
      - 6.1.4.3 The characteristic values of transpiration flow, 407
      - 6.1.4.4 Comparison of the period following flood control measures with that of diminishing floods, 410
    - 6.1.5 Conclusion, 413
    - 6.1.6 References, 415
  - 6.2 The water relations of the herb, shrub and tree layers of the floodplain forest (M. Penka), 419
    - 6.2.1 Introduction, 419
    - 6.2.2 Material and methods, 419
    - 6.2.3 Results, 421
    - 6.2.4 Discussion, 435
    - 6.2.5 Summary, 445
    - 6.2.6 References, 446
- 7 Reaction of floodplain forest secondary producers to changed moisture conditions, 449
- 7.1 Selected groups of insects and harvestmen (J. Křístek), 451
    - 7.1.1 Introduction, 451
    - 7.1.2 Methods, 451
    - 7.1.3 Results, 453
      - 7.1.3.1 *Opiliones*, 453
      - 7.1.3.2 *Psocoptera*, 455
      - 7.1.3.3 *Heteroptera*, 457
      - 7.1.3.4 *Carabidae (Coleoptera)*, 463
    - 7.1.4 Discussion, 465
    - 7.1.5 Summary, 467
    - 7.1.6 References, 468
  - 7.2 The effect of changes in moisture conditions on a community of haematophagous *Diptera* and ticks in a floodplain forest (J. Knoz and J. Vaňhara), 469
    - 7.2.1 Introduction, 469
    - 7.2.2 Material and methods, 470
    - 7.2.3 Results, 472
      - 7.2.3.1 Species composition of haematophagous *Diptera* and ticks in southern Moravia, 472

- 7.2.3.2 The long-term effects of the hydroengineering works on a community of mosquitoes (*Culicidae*) on the lower reaches of the river Dyje, 473
  - 7.2.3.2.1 Qualitative composition, 473
  - 7.2.3.2.2 Dominance, its dynamics and concentration, 474
  - 7.2.3.2.3 Reaction of mosquitoes to new ecological conditions, 477
  - 7.2.3.2.4 The effect of the hydroengineering works on the community of mosquitoes, 479
- 7.2.3.3 Present state of development of a community of biting midges (*Ceratopogonidae*) of the genus *Culicoides* in a drying floodplain forest, 481
  - 7.2.3.3.1 Qualitative composition, 481
  - 7.2.3.3.2 Zoogeographical evaluation of the community, 482
  - 7.2.3.3.3 Dominance and its dynamics and concentration, 483
- 7.2.3.4 The effect of meteorological factors on the activity of adult individuals of the communities of mosquitoes and of biting midges of the genus *Culicoides*, 488
  - 7.2.3.4.1 The effect of temperature, 488
  - 7.2.3.4.2 The effect of air humidity, 491
  - 7.2.3.4.3 Other meteorological factors, 492
- 7.2.3.5 Trophic bonds of haematophages of the southern Moravian floodplain forest, using the example of a community of mosquitoes (*Culicidae*), 493
- 7.2.4 Summary, 495
- 7.2.5 Appendix, 498
- 7.2.6 References, 502
- 7.3 A community of small terrestrial mammals (J. Zejda), 505
  - 7.3.1 Introduction, 505
  - 7.3.2 Material and methods, 506
  - 7.3.3 Results, 507
    - 7.3.3.1 The reproduction ecology of the various species and population, 507
    - 7.3.3.2 Characteristics of the community, 509
      - 7.3.3.2.1 Dominance, 509
      - 7.3.3.2.2 Density, 510
      - 7.3.3.2.3 Population dynamics, 511
      - 7.3.3.2.4 Diversity, 513
      - 7.3.3.2.5 Constancy, 514
    - 7.3.3.3 Energy flow through populations of species and through the community as a whole, 514
      - 7.3.3.3.1 Mortality, average age, turnover, 514
      - 7.3.3.3.2 Production, 516
      - 7.3.3.3.3 Consumption, 516
  - 7.3.4 Discussion, 517
  - 7.3.5 Conclusion, 519
  - 7.3.6 Summary, 520
  - 7.3.7 References, 521
- 7.4 Changes in the structure of the avian community (Z. Bauer), 523
  - 7.4.1 Introduction, 523

- 7.4.2 Methods, 523
  - 7.4.3 Results, 525
  - 7.4.4 Summary, 530
  - 7.4.5 References, 531
- 8 Use of forest resources in the floodplain landscape following the changes in moisture regime, 533
- 8.1 Principles of forest management planning (D. Macháč), 535
    - 8.1.1 Introduction, 535
    - 8.1.2 Methods, 535
    - 8.1.3 Results and discussion, 536
      - 8.1.3.1 The silvicultural system, 536
      - 8.1.3.2 Target composition and spatial arrangement, 537
      - 8.1.3.3 Temporal arrangement of the forest, 538
      - 8.1.3.4 The target timber production, 539
    - 8.1.4 Conclusion, 542
    - 8.1.5 References, 542
  - 8.2. The recreational use of the floodplain forest (S. Volný), 543
    - 8.2.1 Introduction, 543
    - 8.2.2 Material and methods, 543
    - 8.2.3 Results, 544
    - 8.2.4 Discussion, 545
    - 8.2.5 Summary, 546
    - 8.2.6 References, 546
  - 8.3 Some ideas for the optimal exploitation of the wood-producing and non-wood-producing functions of the forest ecosystems in a new ecological situation (F. Vašíček and J. Hromas), 549
    - 8.3.1 References, 552
- 9 Use of land resources after draining of originally inundated floodplain meadows, 553
- 9.1 Natural and recultivated meadows (J. Lesák and A. Pavlíček), 555
    - 9.1.1 Introduction, 555
    - 9.1.2 Material and methods, 555
    - 9.1.3 Results, 557
      - 9.1.3.1 Changes in the population structure of the floodplain meadows, 557
      - 9.1.3.2 Influencing the production of above-ground biomass, 559
      - 9.1.3.3 Influencing the weight of underground organic matter and roots, 562
      - 9.1.3.4 The supply and consumption of nutrients in the grass stand, 562
      - 9.1.3.5 The effectiveness of the transformation of solar radiation and the possibility of influencing the energy values of grasslands, 564
    - 9.1.4 Summary, 566
    - 9.1.5 References, 568
  - 9.2 The ecology and production of field crops on ploughed meadows (J. Zimolka), 571
    - 9.2.1 Introduction, 571
    - 9.2.2 Methods, 571



- 9.2.3 Results and discussion, 572
    - 9.2.3.1 Winter wheat, 572
    - 9.2.3.2 Grain maize, 576
    - 9.2.3.3 Spring barley, 578
    - 9.2.3.4 Sugar beet, 578
    - 9.2.3.5 Clover, 579
    - 9.2.3.6 Beans, 579
    - 9.2.3.7 The productivity of crop rotation, 579
    - 9.2.3.8 Supply, uptake and leaching of nutrients, 582
  - 9.2.4 Summary, 584
  - 9.2.5 References, 586
- 10 The influence of hydrological works on the water biome (J. Heteša and I. Sukop), 587
    - 10.1 Introduction, 587
    - 10.2 Material and methods, 587
    - 10.3 Results and discussion, 590
      - 10.3.1 Regulated watercourses, 590
        - 10.3.1.1 Phytoplankton and primary production, 590
        - 10.3.1.2 Zoobenthos, 591
        - 10.3.1.3 Drift, 592
        - 10.3.1.4 The effect of regulation on the biocoenoses, 592
        - 10.3.1.5 The effect of the reservoir on the biocoenoses of the reach below it, 593
      - 10.3.2 The new reservoirs, 594
        - 10.3.2.1 Phytoplankton and primary production, 594
        - 10.3.2.2 Macrophyta, 599
        - 10.3.2.3 Zooplankton, 599
        - 10.3.2.4 Zoobenthos, 600
        - 10.3.2.5 Fish stock, 602
        - 10.3.2.6 The function of the ecosystem of the reservoir and ecological disasters, 603
    - 10.4 Summary, 604
    - 10.5 References, 605
  - 11 Conclusions (F. Vašíček), 607

Figures-Maps

Plates

Index, 621