

- Preface p. v
- 1 Introduction to Field Sampling p. 1
- 1.1 Assessing the Sampling Needs p. 3
- 1.2 Soil p. 5
- 1.3 Water and Air p. 8
- 1.4 Presampling p. 10
- 1.5 Safety p. 11
- 1.6 Sampling p. 11
- 1.7 Statistics p. 13
- 1.8 Modeling p. 13
- 1.9 Sample Handling p. 14
- 1.10 What Is Present? p. 15
- 1.11 Analytical Methods p. 16
- 1.12 Traps p. 16
- 1.13 Essential Units p. 17
- 1.14 Definitions p. 19
- 1.15 Other Ways of Sampling and Representing the Environment p. 20
- 1.16 Global Positioning System (GPS) p. 21
- 1.17 Geographical Information Systems (GIS) p. 22
- 1.18 Conclusions p. 23
- Questions p. 23
- References p. 24
- 2 Characteristics of the Environment p. 26
- 2.1 Parts of the Environment p. 27
- 2.2 Soil Formation p. 35
- 2.3 Soil Types p. 39
- 2.4 Soil Texture, Structure, and Bulk Density p. 41
- 2.5 Water Movement Over and Through Soil p. 49
- 2.6 Conclusions p. 54
- Questions p. 54
- References p. 55
- 3 Presampling p. 57
- 3.1 Field Office p. 58
- 3.2 Field Office Laboratory p. 59
- 3.3 The Project Notebook p. 61
- 3.4 Maps p. 65
- 3.5 Preliminary Field Survey p. 69
- 3.6 Field History p. 71
- 3.7 Sampling Tools p. 73
- 3.8 Other Soil Sampling Considerations p. 77
- 3.9 Safety p. 79
- 3.10 Sample Containers p. 79
- 3.11 Transportation and Storage p. 82
- 3.12 Chain of Custody p. 82

- 3.13 Analytical Laboratory and Procedures p. 83
- 3.14 Statistics p. 84
- 3.15 Other Tools to Consider p. 84
- 3.16 Modeling p. 87
- 3.17 Permitting p. 88
- 3.18 Resources p. 88
- 3.19 Conclusions p. 88
- Questions p. 89
- References p. 90
- 4 Safety p. 91
- 4.1 Areas of Safety Concern p. 92
- 4.2 Safety Resources p. 94
- 4.3 Basic Safety p. 96
- 4.4 Signage p. 96
- 4.5 Personnel Exposure p. 100
- 4.6 Personnel Protection p. 104
- 4.7 Monitoring p. 111
- 4.8 Safety at Different Field Types p. 112
- 4.9 Contamination Types and Concentrations p. 114
- 4.10 Off-Field Protection p. 115
- 4.11 The Chemical Hygiene Plan p. 115
- 4.12 Environmental Protection p. 116
- 4.13 MSDS Sheets p. 116
- 4.14 Merck Index p. 117
- 4.15 Conclusions p. 117
- Questions p. 118
- References p. 118
- 5 Sampling p. 120
- 5.1 General Sampling Considerations p. 121
- 5.2 Global Positioning System p. 123
- 5.3 Ground-Penetrating Radar p. 128
- 5.4 Remote Sensing p. 130
- 5.5 Geographical Information Systems p. 130
- 5.6 Samplers p. 132
- 5.7 Sample Amount p. 136
- 5.8 Sample Container p. 138
- 5.9 Duplicate, Split, and Composite Samples p. 138
- 5.10 Sampling Strategies p. 139
- 5.11 Topography p. 143
- 5.12 Other Sampling Strategies for Different Field Situations p. 144
- 5.13 Sample Handling p. 153
- 5.14 Sampling Using GPS p. 153
- 5.15 Determining Sample Sites p. 155
- 5.16 Quality Control p. 157

- 5.17 Labeling p. 157
- 5.18 Conclusions p. 159
- Questions p. 159
- References p. 160
- 6 Statistics p. 162
- 6.1 Random Numbers p. 164
- 6.2 Variation p. 165
- 6.3 Population p. 166
- 6.4 Hypothesis p. 168
- 6.5 Median and Mean p. 169
- 6.6 Standard Deviation p. 171
- 6.7 Different or Same Population? p. 173
- 6.8 Extraneous Values p. 175
- 6.9 How Many Samples? p. 177
- 6.10 Comparing Areas p. 178
- 6.11 Linear Regression p. 181
- 6.12 Geostatistics p. 181
- 6.13 Coregionalization p. 190
- 6.14 Geostatistical Problems p. 191
- 6.15 Conclusions p. 191
- Questions p. 192
- References p. 192
- 7 Modeling p. 194
- 7.1 Physical Models p. 196
- 7.2 Chemical Models p. 203
- 7.3 Simple Mathematical Models p. 207
- 7.4 Landscape Models p. 208
- 7.5 Modeling Movement of Particles Through the Environment p. 211
- 7.6 Dynamic Models p. 212
- 7.7 Commercial Computer Modeling p. 217
- 7.8 GIS and Environmental Modeling p. 221
- 7.9 Whole Planet Model p. 221
- 7.10 Conclusions p. 221
- Questions p. 221
- References p. 222
- 8 Sample Transport and Storage p. 224
- 8.1 Security p. 226
- 8.2 Containers p. 228
- 8.3 Controls p. 229
- 8.4 Transport in the Field p. 231
- 8.5 Transport Boxes p. 231
- 8.6 Transport Out of Field p. 233
- 8.7 Storage p. 233
- 8.8 Archival Samples p. 234

- 8.9 Separation of Samples at the Field Office p. 235
- 8.10 Field Laboratory Handling p. 235
- 8.11 Transportation to the Commercial Laboratory p. 235
- 8.12 Storage at the Commercial Analytical Laboratory p. 237
- 8.13 Chain of Custody p. 237
- 8.14 Computer Chain of Custody p. 238
- 8.15 Request for Analysis p. 241
- 8.16 Conclusions p. 243
- Questions p. 244
- References p. 245
- 9 What Is Present? p. 246
- 9.1 In Total p. 248
- 9.5 The Living Component p. 271
- 9.2 The Inorganic Components p. 250
- 9.3 The Organic Component p. 260
- 9.4 The Biochemical Component p. 269
- 9.6 Conclusions p. 273
- Questions p. 273
- References p. 274
- 10 An Overview of Basic Principles of Analytical Methods Rolf Meinholtz p. 276
- 10.1 Determining the Problem p. 281
- 10.2 What is the Nature of the Sample? p. 282
- 10.3 The Sampling Process p. 283
- 10.4 What Is to Be Sampled and How Is It to Be Sampled p. 285
- 10.5 Documentation p. 290
- 10.6 Sample Preparation for Analysis p. 291
- 10.7 Analytical Testing p. 291
- 10.8 Analytical Methods--Some Specifics p. 304
- 10.9 Data Assessment p. 307
- 10.10 Report Generation and Documentation p. 309
- 10.11 Do the Results Answer the Client's Question? p. 310
- 10.12 Some General Questions and Considerations p. 310
- 10.13 Conclusions p. 311
- Questions p. 311
- References p. 312
- 11 Traps, Mistakes, and Errors Alfred R. Conklin, Jr. and Rolf Meinholtz p. 313
- 11.1 History of the Area p. 314
- 11.2 Area Geology p. 316
- 11.3 Knowing What Is or Is Likely to Be Present p. 318
- 11.4 Not Accounting for Inputs, Losses, and Movement p. 319
- 11.5 Personnel p. 320
- 11.6 Analyzing or Sampling for the Wrong Component p. 323
- 11.7 Antagonisms and Interferences p. 323
- 11.8 Sample Analysis Mismatch p. 325

- 11.9 Extraction or Method Errors p. 325
- 11.10 Sample/Test Container Errors p. 326
- 11.11 Improper Sampling Techniques p. 326
- 11.12 Variations in Method p. 327
- 11.13 Movement of a Contaminant p. 327
- 11.14 Statistical Errors p. 328
- 11.15 Conclusions p. 328
- Questions p. 328
- References p. 329
- Appendix A Abbreviations and Acronyms p. 330
- Appendix B Sources p. 333
- Index p. 335