INDEX

A

accuracy assessment • 3, 56, 155, 188, 192, 226, 287, 290, 339
aerial photography • 276, 277, 293
aggregation • 40, 101, 264, 268
air pollution • 167, 193
air quality • 191
allometric scaling • 10, 21, 22, 23, 24, 268, 337
allometry • 10, 21, 23, 170, 177, 330, 337, 340
  biological • 10, 23, 330, 337, 340
  landscape • 24
  spatial • 23, 24, 25, 337
analysis scale • 7
artificial neural networks (ANNs) • 38
atmospheric deposition • 118, 167, 192, 193, 199, 205, 207, 211, 217
autocorrelation • 68, 69, 70, 76, 77, 80, 86, 87, 254, 265

B

Bayesian Forecasting System • 53, 59
Bayesian statistics • 53, 58, 63, 339
benthic community structure • 225
biogeochemical processes • 35, 109, 114, 120, 126, 149, 151, 167, 168, 169, 170, 177, 180, 188, 192, 193, 195, 196, 198, 335

C

canopy radiation regime • 150
carbon allocation • 149, 169
carbon cycle • 170, 180
carbon dioxide • 124, 167, 173, 174
carbon sequestration • 131, 133, 167
cartographic scale • 8
characteristic scale • 3, 4, 5, 6, 7, 158, 329, 331, 335, 336, 342
classification and regression trees (CART) • 38, 208, 209, 219, 335
climate systems • 109
climatic zones • 169, 177
coarse-graining • 10, 11, 27, 28, 30
combinatorial theory of occupancy • 89, 339
components of scale • 5, 6, 8, 12, 318, 330
confidence intervals • 46, 52, 60, 67, 68, 69, 87, 94, 234, 344
critical phenomena • 20, 120, 121, 125, 263
criticality • 20, 335, 340

D

data uncertainty • 50
decision-making • 45, 46, 63, 315, 316, 317, 318, 320, 322, 324, 329, 340
decomposition • 80, 83, 115, 118, 120, 121, 149, 158, 167, 174
dimensional analysis • 19, 21, 337
dimensions of scale • 5, 6, 7, 8
direct extrapolation • 27, 30, 31, 32, 33, 110, 338
disaggregation • 27, 37
downscaling • 10, 17, 26, 27, 36, 37, 38, 89, 317, 318, 319, 323, 338
dynamic model-based scaling • 12, 17, 25, 27, 38, 39, 338, 341

E

ecosystem ecology • 131, 132, 140, 141, 142, 143
error analysis • 56, 155, 192, 226, 287
error of commission • 132, 133, 143, 278, 287
error of omission • 132, 133, 143, 278, 287

error propagation • 51, 52, 55, 241, 242, 243, 254, 255, 339, 340
experimental design • 4, 110, 143, 192, 197, 201
experimental scale • 7
extent • 3, 11, 18, 28, 31, 117, 241, 270, 278, 281, 286, 287, 294, 297, 298
external validity • 123, 124, 125, 336
extrapolation • 10, 11, 12, 27, 28, 29, 30, 31, 32, 33, 35, 39, 46, 110, 111, 112, 114, 115, 117, 119, 124, 125, 126, 131, 132, 133, 135, 137, 138, 139, 143, 148, 149, 169, 175, 199, 200, 245, 270, 335, 338

F

fine-graining • 10, 11, 27, 37
forest fragmentation • 121, 210, 212, 261, 265, 267, 270
fractal scaling • 21, 23, 25, 337
fractals • 10, 18, 19, 20, 24, 335, 340

G

General Circulation Models (GCMs) • 37, 38, 46, 338
geographic scale • 8
geometric scaling • 21, 23
geostatistics • 7, 8, 26, 79
global change • 37, 45, 126, 167, 169, 188
grain • 8, 9, 10, 23, 28, 30, 31, 32, 33, 34, 36, 281, 289, 290, 291, 293, 336

H

heterogeneity • 8, 12, 26, 27, 28, 29, 30, 31, 32, 33, 35, 39, 46, 50, 51, 63, 112, 113, 114, 133, 135, 140, 142, 148, 151, 153, 156, 225, 229, 298, 338, 339, 341, 342, 343
hierarchical patch dynamics • 35, 36, 67, 335, 340, 341
hierarchy theory • 4, 5, 8, 35, 220, 321, 330, 335, 340, 341

I

intact ecosystem experiments • 110, 111
integrated assessment • 240, 241, 242, 255
interdisciplinarity • 109, 341
internal validity • 123, 125
interpolation • 10, 11, 26, 50, 181
intrinsic scale • 7, 8, 117, 315, 330, 331, 336
isometric scaling • 21, 23

K

kinds of scale • 5, 6, 7, 8, 323, 330, 335, 341
kriging • 26, 152, 159, 160

L

land use and land cover • 12, 149, 151, 160, 171, 179, 239, 242, 245, 255, 264, 279, 292
landscape ecology • 25, 92, 330, 337
landscape pattern • 34, 195, 196, 239, 289, 341
landscape pattern analysis • 19, 36, 98, 208, 265, 266, 291, 293, 335, 343

M

macroecological pattern • 89, 103
measurement scale • 7, 264
metamodeling • 40, 341
metapopulation • 33, 35, 241, 242, 243, 244, 247, 249, 251, 252, 253
model ecosystem experiments • 110, 111, 126
model ecosystems • 110, 111, 124, 126
model validation • 50, 52, 53, 170, 172, 174, 187, 188
modeling scale • 7
modifiable areal unit problem • 4, 336

Monte Carlo simulation • 30, 32, 47, 53, 56, 57, 58, 60, 61, 62, 63, 175, 244, 256, 339
multilevel models • 67, 68, 70, 73, 75, 77, 83, 84, 270, 336

N

NDVI • 151, 153, 154, 155, 157, 160, 179
nested modeling • 38, 338, 341
net ecosystem production (NEP) • 149, 167, 168, 170, 172, 173, 174, 175, 185, 186, 187, 188
net primary productivity (NPP) • 45, 118, 134, 149, 169, 170, 172, 177, 184, 185, 186
nitrogen deposition • 118, 167, 199, 205, 207, 211, 217
nonlinearity • 12, 30, 33, 46, 51, 110, 113, 116, 119, 122, 153, 169, 339, 340, 342
non-spatial methods • 70, 71, 131, 132, 133, 134, 137, 138, 139, 142, 338
nutrient enrichment • 225
nutrient export • 225, 226, 227, 228, 229, 230, 231, 232, 234, 235

O

observational scale • 7, 8, 101, 149, 315, 329, 335, 336
occurrence maps • 91

P

patch dynamics • 34, 35, 341
percolation theory • 20, 263
policy scale • 7, 315, 323, 330, 335
population ecology • 12, 33, 251, 254, 255, 329, 335
power-law relationships • 10, 18, 19, 21, 22, 24, 27, 39, 40, 155, 229, 331, 340
process scale • 7, 315
process-based downscaling • 38

R

regression • 19, 22, 23, 38, 39, 61, 62, 67, 68, 69, 70, 71, 73, 75, 79, 83, 85, 86, 87, 137, 139, 140, 157, 159, 160, 179, 185, 186, 208, 211, 213, 214, 215, 217, 219, 234, 243, 245, 252, 262, 264, 265, 267, 304, 343
Regression Tree Analysis (RTA) • 208, 209, 210, 213, 217, 219
remote sensing • 26, 35, 142, 147, 148, 149, 151, 152, 154, 155, 157, 160, 168, 170, 171, 172, 173, 177, 179, 181, 182, 187, 188, 193, 240, 275, 276, 289, 294, 338
renormalization group methods • 20
representative flux • 194, 197, 201
representative landscape unit • 195
representative parameter • 29
resolution • 37, 116, 152, 156, 180, 199, 270, 290, 292, 294, 310
riparian buffers • 206, 240
riparian vegetation • 276, 290, 291, 292
riparian zone • 205, 207, 217, 275, 276, 285, 289, 290, 291, 292, 293

S

sampling density • 8, 117
sampling error • 50, 102, 175, 264, 344
sampling methods • 47, 51, 137
sampling scale • 7, 101
scale
  definition • 4, 5, 7, 11, 13, 17, 330, 341
  domains • 35, 36, 40, 335, 343
  effect • 3, 225, 226, 228, 276, 278, 280, 291, 298, 309, 322, 324, 329, 331, 335, 336, 337, 339, 342
scale analysis • 331, 335, 343
scale dependence • 3, 260
scale mismatch • 7, 181, 331, 335
scale multiplicity • 3, 12, 310
scale transfer • 7, 10
scale triplet • 8
scale-invariance • 10, 18, 19, 335, 336, 341

scaling
  approaches • 12, 17, 23, 25, 27, 38, 39, 40, 337, 338, 341
  definition • 9, 10, 11, 315, 330, 331
  errors • 28, 32, 51, 152, 153, 154, 155, 329, 340, 343, 344
  methods • 12, 13, 17, 23, 25, 27, 35, 36, 38, 39, 132, 133, 152, 331, 337, 338, 339, 340, 341, 342, 343
  strategies • 159, 168, 241, 342
  theory • 4, 5, 8, 18, 35, 148, 160, 220, 321, 330, 335, 340, 341
scaling down • 10, 11, 17, 26, 27, 36, 37, 38, 89, 317, 318, 319, 323, 338
scaling exponent • 19, 21, 22, 23, 24, 155
scaling functions • 17, 207, 220, 270
scaling ladder approach • 35, 36, 67, 335, 340, 341
scaling thresholds • 12, 17, 341, 343
scaling up • 10, 11, 12, 17, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 39, 40, 46, 59, 110, 111, 112, 115, 117, 119, 124, 125, 126, 131, 132, 133, 135, 137, 138, 139, 143, 148, 149, 151, 153, 154, 160, 168, 169, 175, 199, 200, 245, 270, 289, 335, 338
scenario analysis • 47, 50
self-similarity • 17, 18, 20, 22, 24, 39, 293, 335, 336, 337
semivariance analysis • 158, 159, 160
sensitivity analysis • 47, 49, 52, 58, 61, 62, 172, 219, 243
similarity
  dynamic • 18, 20
  functional • 18, 20
  geometric • 18, 21, 22, 39
  hydrodynamic • 18
  physical • 18
similarity analysis • 19, 20, 21, 38, 337
similarity-based scaling • 17, 23, 25, 38, 39, 337
singling out • 27
sources of error • 35, 151, 157, 207, 219, 244, 247, 253, 329, 344
sources of uncertainty • 46, 47, 48, 49, 52, 61, 62, 63, 143, 174, 226, 230, 240, 242, 243, 244, 251, 252, 255, 256, 276, 324, 329, 339
space-time correspondence principle • 5, 330
spatial heterogeneity • 12, 26, 27, 28, 30, 31, 32, 33, 35, 39, 46, 50, 51, 63, 112, 113, 114, 133, 140, 142, 148, 225, 229, 298, 338, 339, 342, 343
spatial statistics • 36, 152, 158, 160, 343
spatial transmutation • 12
spatially explicit methods • 26, 30, 32, 34, 39, 45, 69, 131, 132, 133, 134, 139, 140, 170, 241, 278, 290, 338
spatially implicit methods • 70, 71, 131, 132, 133, 134, 137, 138, 139, 142, 338
spatially interactive methods • 33, 35, 338
species abundance • 24, 89, 102, 103
species distribution • 89, 90, 329, 339
species richness • 111, 116, 217, 219
species-area relationship • 24
spectral mixture analysis • 151, 152, 156, 160
statistical downscaling • 37, 38, 338

T

transfer functions • 38

U

uncertainty • 3, 32, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, 59, 60, 61, 62, 63, 124, 143, 167, 174, 191, 226, 230, 240, 242, 243, 244, 248, 250, 251, 252, 253, 254, 255, 256, 276, 324, 329, 339, 343, 344
uncertainty analysis • 3, 32, 46, 47, 49, 50, 51, 52, 54, 56, 60, 61, 63, 124, 155, 167, 191, 192, 226, 243, 252, 253, 255, 287, 339, 343
  Bayesian statistical method • 58, 59
  definition • 47
  methods • 59, 61, 200
  Monte Carlo simulation • 30, 32, 47, 53, 56, 57, 58, 60, 61, 62, 63, 175, 244, 256, 339
  Probability theory • 53, 54, 55, 59, 61, 339
  quantification of • 58
  sequential partitioning • 53, 59, 63, 339

sources of • 46, 47, 48, 49, 52, 61, 62, 63, 143, 174, 226, 230, 240, 242, 243, 244, 251, 252, 255, 256, 276, 324, 329, 339
Taylor series expansion • 53, 55, 63, 339
upscaling • 10, 11, 12, 17, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 39, 40, 46, 59, 110, 111, 112, 115, 117, 119, 124, 125, 126, 131, 132, 133, 135, 137, 138, 139, 143, 148, 149, 151, 153, 154, 160, 168, 169, 175, 199, 200, 241, 245, 270, 289, 335, 338
upscaling methods
direct extrapolation • 27, 30, 31, 32, 33, 110, 338
explicit integration • 27, 32, 33, 338
extrapolation along a scaling ladder • 35, 36, 133, 335, 338, 341
extrapolation by effective parameters • 28, 29, 338
extrapolation by expected value • 27, 31, 32, 33, 338
extrapolation by lumping • 27, 28, 338
spatially interactive modeling • 33, 35, 338

V

validation • 52, 174
vegetation indices • 142, 150, 154
vegetation pattern • 120, 275, 291, 337

W

water quality • 56, 57, 77, 191, 221, 276, 297, 298, 299, 309, 311, 315, 316, 317, 320, 321, 322, 323, 324
watershed hydrology • 240, 255