CAMBRIDGE

Cambridge University Press
978-0-521-47109-1 - Scaling-Up: From Cell to Landscape
Edited by P. R. van Gardingen, G. M. Foody and P. J. Curran
Index
More information

Index

AATSR *see* Advanced Along-Track Scanning Radiometer
Acer pseudoplatanus 141
Advanced Along-Track Scanning Radiometer (AATSR) 176, 191
Advanced Very High Resolution Radiometer (AVHRR) 36, 48, 54, 55, 62, 73, 174–9, 191, 201, 209–14, 221, 302–4, 314
AFRC energy model (1980) 29, 31
AFRCWHEAT 261–4, 273, 281
aggregation 183–92
  FIFE data 325
  of land units 295–315
  patch scale to GCM grid scale 229–49
  of remote-sensed topographical data 302
Agriculture and Food Research Council *see* AFRC
Agrostis stolonifera 111
albedo *see* surface albedo
Along-Track Scanning Radiometer (ATSR) 191
Amazon 204, 207, 211–14, 221
analysis, scientific 7, 13
animal weight-gain energy model 29
arable land, and set-aside 22–5
arbuscular mycorrhyzal fungi (AMF) 151, 155, 159–61, 162, 168
Arrhenatherum elatius, 111
association and aggregation 183–92
ATSR *see* Along-Track Scanning Radiometer
Australia, SCOPE initiative 29
Avena fatua 131
AVHRR *see* Advanced Very High Resolution Radiometer

barley 49–53
beech 152
Bellucia 215
Betula pendula 157–8
Bibury, England, roadside vegetation survey 109
biospheric homeostasis 7
Biotron 161–6, 168
bivariate distribution function (BDF) 52–3, 54
BOREAS 372
Botanical Society of the British Isles (BSBI) monitoring scheme 116
boundaries and boundary conditions, and scaling behaviour 269
boundary layer circulations 239–48, 339–40
Bowen ratio (BR) 322–7
Brazilian Amazon 204, 207, 211–14, 221
Brownian motion 266
bulk physiology model 93–9

Californian forest, remote sensing 62
Cameroon tropical forest 207, 208
Canada
  land use research programme 20
  RHESSyS project, Montana 297–315
canopy 8–9, 79–99, 296, 314
  closure, and satellite data 303–4, 314
  conductance 337–9, 348
  flux density 88, 296, 314
  open and closed 86
  photosynthesis 283, 348
  variables 209–14, 349–52
captured resource apportionment 107
carbon budgets
  and roots 151–3, 161–6, 374
  stand-to-landscape level 297
  tropical forests 201–22
carbon cycle 99, 152, 201–2, 358, 359–62, 372
  modelling 229, 358,
carbon dioxide
  impact on vegetation 11
  increase 12, 262–4, 376
    and plant community responses 109–12, 122–3
  and root systems 151–2, 161–6
  and termites 9–10

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-47109-1 - Scaling-Up: From Cell to Landscape
Edited by P. R. van Gardingen, G. M. Foody and P. J. Curran
Index
More information

carbon exchange process 295–6
carbon flux 36, 79, 201–8, 229
  estimation of 207–8, 360–2
carbon pool, tropical 203–4
carbon sinks 109, 112, 123, 201–8, 374
carbon sources 201–2
categorical generalisation 183–92
Cecropia 214
Chamaenerion angustifolium 109
chaotic phenomena 258–9, 269
chloroplasts 8
classification of forest regeneration stages 215–22
climate change 7, 9, 10, 99, 173, 202, 206, 371, 372–4
  and crop models 260–64
climate modelling 99, 319, 347–9, 359–65; *see also* General Circulation Models
cluster–cluster aggregation of soil 265–6
Colorado State University GCM 359
Commelina communis 131, 137, 140–1, 142, 143
conditional simulation 53, 54
confusion matrices 216–17
convolution 185
Convollulus arvensis 111
core sampling 162–3
couplings 18, 24, 26, 253, 352
crops
  growth rate (CGR) 283
    and weather, interaction of 260–4
  phenology 274–7
  production models 273–92
  survey and comparison with remote sensing data 49–52
  variability 273–92
  see also specific crops
CSR plant strategy theory 117–24

Dactylis glomerata 111
Datura stramonium 143
decision making in land use 25, 30–3
denitrification 267
diffusion limited aggregation (DLA) of soil 265–6
digital elevation models (DEMs) 300, 314
diversity in managed land 25
DNA in plants, and temperature variation 108–9, 123
domains of scale 180–3, 191
drainage basin outflow, observed and modelled 308–10
drought resistance 112–16, 123

ecological fallacy 3
ecological research, and scaling effects 3
ecosystems
  behaviour prediction 295–7
  function testing methods 107–8
  scaling to ecosystem level 161–9, 374
  see also forest ecosystems
eddy correlation (EC) 322–7, 360
elevation, mean 305–6, 312–13
Elytrigia repens 111
energy budgets 347
  observation and simulation 319–35, 362–5
energy partition, simulation of 336
environmental change 371, 372–4
  predicting plant responses 105–24
  see also climate change
environmental process models, scaling 61–76
environmental research, and remote sensing 221–2
EOS programme 376
Eucalyptus spp. 152
European Union, crop productivity 280–1
evaporation 232–6
  flux, in GCMs 336–7
  meso-scale model 241–8
evaporative fraction (EF) data 321–5
  linking to remote sensing values 327–31
  spatial variation in 331–4
evapotranspiration 310, 325, 336–7, 338–9
evolution by natural selection 7, 8, 11–12
extreme events *see* weather

farming systems
  variability, and crop models 286–8
  management 17–33
feedbacks and feedforwards 10–11, 12
Ficus elastica 140, 141
field measurements, surface flux 320
field trials for crop modelling 49–52, 274, 282–3
FIFE experiment 319–44, 372
  and SiB2 off-line simulations 362–4
  and single column model (SCM) 339–44
filtering 185
fingerprinting techniques 168
fire resilience 112–16
flora, scaling from plant to community and region 105–24
fluorescence analysis of photosynthetic activity 132
forest ecosystems
  impact on regional and global fluxes 13–15
  modelling 67, 99
  remote sensing 67
  response to CO_2 11
  see also canopy; tropical forests; woodland
fractal structure 264–9

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-47109-1 - Scaling-Up: From Cell to Landscape
Edited by P. R. van Gardingen, G. M. Foody and P. J. Curran
Index
More information

frost resistance 112–16, 123
fungi *see* mycorrhizal fungi

gas exchange measurements 132, 353
General Circulation Models (GCMs)
  aggregating from patch scale 229–49
  and crop growth models 260–4, 291
  land surface parameterisations 336–7
  scaling up of energy budgets 319, 336–7
  simulation of biological processes in 347–65
  see also Single Column Model (SCM)
generalisation (image data) 173, 176, 183–92
genomes 8, 107
genotype variation 157–8
Geographic Information Systems (GIS) 3, 72, 73–5, 291, 375–6
geological mapping 36
geomorphological mapping 36
Geophysical Fluid Dynamics Laboratory (GFDL) GCM 260
geostatistics 37–55, 163
Global Area Coverage (GAC) 175
Global Positioning System (GPS) 274
global-scale monitoring by remote sensing 35–7, 173–92
global scaling-up 79, 173, 176, 183–92, 319
Global Vegetation Index (GVI) 175
global warming 372–3
  predicting plant community response 108–9
  role of root systems and soil 151–2
  see also greenhouse warming
Glomus E3 160, 161
gradient 306, 307, 312–13, 315
grain-flow meter 274
grain-yield modelling 273–93
grains *see* barley; maize; wheat
Green Area Index (GAI) 283–4
greenhouse warming 3, 12, 372; *see also* global warming
ground resolution element (GRE) 36–7, 48, 52

HAPEX 371
HAPEX-MOBILHY 233, 240
HAPEX-Sahel 371–2
heat flux modelling 229–31, 234–7, 319, 351
heat pulse method of flow measurement 155
Helianthus annuus 141
heterogeneity 18, 24, 26, 80, 137–46, 188, 254–6
  and crop production models 274
  at meso-scale 239–48
  at patch scale 237–9, 248
  in scaling-up watershed processes 295–315
  and surface fluxes 229–49
  see also spatial heterogeneity; temporal heterogeneity
hierarchical sampling 48–53, 63–71
hierarchical scaling 10–15; *see also* nested-hierarchical models
High Resolution Picture Transmission (HRPT) 175
High Resolution Visible (HRV) MSS 36
hillslope partitions 300, 310
homeostasis 7, 11
homogeneity 254–6, 257, 266, 285; *see also* heterogeneity
host/parasite modelling 27–9, 32
HRPT *see* High Resolution Picture Transmission
HRV *see* High Resolution Visible (HRV) MSS
hydrographs, observed and simulated 308–10, 314
hydrology
  of hillslopes 300
  over-parameterisation 297
  regional scale 8, 10, 11
  in SVAT schemes 230–6, 249

Illinois, maize yields 281
Improved TIROS (ITOS) 36
infrared analysis 132
Instantaneous Field-of-View (IFOV) 175, 176–7
instrumentation-related difficulties 322–3
Integrated Screening Programme (ISP) 106–8
intellectual types 13
interdisciplinary programmes, need for 371–2
Intergovernmental Panel on Climate Change 202, 206, 371
International Geosphere–Biosphere Programme (IGBP) 176, 371
International Satellite Land Surface Climatology Programme (ISLSCP) 319
Interpolation and smoothing 53–4
ITOS *see* Improved TIROS

Kansas, prairie grassland FIFE experiment 320
kernal-based generalisation 184, 185–9, 192
Konza Prairie, USA 320
kriging 49–51, 52–4, 69, 163
Kulbenka–Munk solution 81–2

LAI *see* leaf area index
Lambertian reflectance 81, 82
land cover mapping, and remote sensing 61–76, 173–92, 375

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-47109-1 - Scaling-Up: From Cell to Landscape
Edited by P. R. van Gardingen, G. M. Foody and P. J. Curran
Index
More information

land evaluation units (LEUs) 273
land surface
  parameterisation in GCMs 336–7, 347; *see also* surface parameters
  see also surface albedo; surface fluxes; surface roughness; surface temperature
land use 7, 17–33
  changes 371, 373
    in tropical forests 202–7
  problems 22
  and remote sensing 36
  research programmes 20–3
  set-aside 22–4
LANDSAT 36, 62, 67, 73, 175, 201, 209; *see also* Thematic Mapper (TM); Multispectral Scanning System (MSS)
landscape disturbance, and plant species 120–2, 123
landscape ecology mapping 185–9
landscape parameterisation by remote sensing 61
landscape units, aggregation of 295–315
large things vs. small things 7–15
large-scale problems 7–15
  system modelling 30–32
LARS-WG stochastic weather generator 263
latent heat flux 230–1
leaf area index (LAI) 61, 73–5, 83–6, 173, 301–8, 348, 349, 375
leaf longevity 107
leaf pore characteristics 129–32, 137–42
leaf-scale level
  'big leaf' model 79–80, 98
  to canopy-scale 79–99
  response to CO_2 89–90, 374
  stomatal characteristics variation 129–47
Local Area Coverage (LAC) 175
local scale remote sensing 36, 72, 75
local to regional scaling-up 209
log-linear scaling 314
Lolium perenne 159
lucerne 89

MAESTRO 80–99
maize (*Zea mays*) 276, 281, 363
management scale 20
mapping
  geological 36
  geomorphological 36
  land cover 61–76, 173–92
  by remote sensing 36
  of stomatal characteristics 136
  tropical forest regeneration stage 209–22
  within-field variability 274, 282–3
MARS project 292
measurement, scale of 39–40
  changing 43–7
Medium Resolution Imaging Spectrometer (MERIS) 176, 191
meso-scale to GCM grid scale 229–49, 323
meteorological factors
  in crop modelling 275, 279–80, 288–91
meteorological remote sensors 36
meteorological stations' data 289–90
meteorological variables in water and carbon flux computations 296, 300
methane 9–10, 372
Michigan University Soil Biotron 161–6, 168
Miconia 215
microbial dynamics and soil structure 265, 266–7
MISR *see* Multi-angle Imaging Spectroradiometer
mixed pixel effect 176–8
mixture modelling 178–9
Moderate Resolution Imaging Spectrometer (MODIS) 176, 177, 191
modular simulation system 297
momentum flux, modelling 229–31, 237–8
Monteith model for energy budget simulation 338–44
MSS *see* Multispectral Scanning System
MT-CLIM 300
Multi-angle Imaging Spectroradiometer (MISR) 176, 191
Multispectral Scanning System (MSS) 36, 67, 211
mycorrhizal fungi 151, 155, 159–61, 162–3, 168

NASA/Ames Research Center 297
national flora study 116–22
national mapping by remote sensing 36
National Oceanic and Atmospheric Administration (NOAA) 36, 174–9, 209, 360
  NOAA-AVHRR HRPT/LAC 175, 176
national policy scale 18–20, 22, 29, 377
NDVI *see* Normalised Difference Vegetation Index
NELUP *see* North Eastern Land Use Project
nested iterations, elimination of 352
nested-hierarchical models 62–71, 163, 180–3; *see also* hierarchical sampling/scaling
net primary productivity estimates 61, 373, 375
Netherlands, species variation study 116–22
nitrates, leaching 24, 25; *see also* denitrification
nitrogen

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-47109-1 - Scaling-Up: From Cell to Landscape
Edited by P. R. van Gardingen, G. M. Foody and P. J. Curran
Index
More information

atmospheric 109, 365
fertiliser usage and crop models 287–8
in soil 112
supply to roots 157–9
nitrous oxide 372
NOAA *see* National Oceanic and Atmospheric Administration
noise, 133, 143, 257, 322, 325–7
Normalised Difference Vegetation Index (NDVI) 49–53, 61, 67–9, 73–5, 175–6, 306
North Eastern Land Use Project (NELUP) 29

oxygen concentration distribution in a fractal soil structure 267
ozone depletion 3

PAR *see* photosynthetically active radiation
parasite population modelling 27–9, 32
patchiness in stomatal characteristics 133–6, 140–7
pathogens, set-aside 24
Penman–Monteith equation 231, 234, 243
persistence 257–8
pests, set-aside 24
phenotypic plasticity of leaves 86–8
phosphate uptake by roots 155–6, 159
photosynthesis 80, 132, 320
of canopy 283, 285, 310, 337–8, 360–2
non-linearity in, 86–99
and root systems 152
photosynthesis-stomatal conductance model 352–7
photosynthetically active radiation (PAR) 79–99, 283–4, 348–9, 352, 357
pixel scale variance 70–5, 176–83
plant
breeding 13
classification 116–24
community responses to environmental change 105–24
root systems 151–69
traits 105, 112–16, 123
Plumas National Forest data set 67–71, 72, 75
policy scale 18–20, 22, 29–32, 377
pollutant loading on vegetation 25
pooled data 163; *see also* nested-hierarchical models
population biology 8
population homeostasis 7
Populus sp. 152, 159
porometry 129–32, 140
potatoes 280, 289
potometry 155, 156
power law relations
magnitude/frequency 257–60
spatial 264–6
prairie grassland surface energy budgets 319–35, 362–5
prediction 12, 31
crop production 273–92
precipitation 348
vegetation responses 107
Priestley–Taylor parameter 321
propagule characteristics 122, 123–4
Prunus roots 155

radiation 319, 320, 376
outgoing longwave 12
radiative transfer models 79–99, 349–50
radiometer design 323
radiosonde observations and SCM 339–40
range of influence 69
raster-format land mapping 173, 185
rate-limiting factors 12
reductionism 25–6
reversing 26–7
region-based generalisation 184, 189–92, 296
regional crop production prediction models 273–92
regional flora studies 106, 116–22
Regional HydroEcological Simulation System (RHESSyS) 297–315
regional scale hydrology 8, 10, 11
regional scale remote sensing 72–5, 173–92
regional scaling-up 79
of carbon fluxes 201–22
of vegetation processes 116–24
remote sensing imagery 3, 13, 35–56, 62–3, 375–6
carbon balance of tropical forests 201–22
classification of tropical forest data 215–22
land cover mapping 61–76, 173–92, 348–9
linking to EF data 327
regeneration stage of tropical forests 209–22
for RHESSyS 301, 314–15
resilience 112–16, 123
resource utilisation 7
respiration 358, 360–2
RHESSyS *see* Regional HydroEcological Simulation System
rhizotron measurements 161–6, 168
root–shoot ratio 157–9
roots
measurement, function and dry-matter budgets 151–69
penetration 107, 123
roughness *see* surface roughness
Rumex obtusifolius 112
rural systems management 17–33

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-47109-1 - Scaling-Up: From Cell to Landscape
Edited by P. R. van Gardingen, G. M. Foody and P. J. Curran
Index
More information

Sahel 238, 240, 372
SAIL 80, 81–6, 92
sampling, hierarchical 48–53
sampling frame/strategy 39–40, 69, 162–3, 168
sampling procedure, and variability 253
satellite sensor imagery *see* remote sensing imagery
scale
  approaches 79–80
  definitions 2, 38
  domains of 180–3, 191
  of measurement 39–40
  variance analysis 181–3
  variation, and spatial dependence 40
scaling behaviour, and boundary conditions 269
scaling laws 33
  and biological phenomena 253–69
scaling-down 25–9
  for crop models 262
  and stomatal behaviour 146
scaling-up 9–15
  examples in other disciplines 13
  and remote sensing 47–56, 173–92
  see also aggregation; and *names of different scales and levels*
Scientific Committee on Problems of the Environment (SCOPE) 29
scientific method, and scaling problems 7–15
SCOPE initiative 29
Scotland
  GAI monitoring 283
  Sitka spruce 84, 93
  soil mapping 285
  wheat phenology 274–7
Scottish Climate Change Initiative (1996) 29
Scottish Office Agriculture, Environment and Fisheries Department (SOAFD)
  integrated programme 20–2, 32
Scutellispora calospora 161
sea breezes 239
sea surface temperature 36
seed dispersal 122, 123–4
seed size 107
semivariograms 65–7, 69–71
set-aside 22–5
shoot biomass screening 108–9
Sierra Nevada, forestry remote sensing 62
sill 69–70, 71
SiB (Simple Biosphere Model) 348–9
  SiB2 349–65
simple scaling 9–10
Single Column Model (SCM) 336, 339–44
Sitka spruce (*Picea sitchensis*) 84, 93, 152
small things v. large things 8–15
smoothing 53–4
SOAEFD *see* Scottish Office Agriculture, Environment and Fisheries Department
socio-economic variables 371, 376–7; *see also* policy scale
soil
  aggregation 265–6
  Biotron 161–6, 168
  and carbon budget 151–2, 166–8, 208
  conditions, and plant community response 122
  data sources 301
  diffusion 266–7
  and methane production 9–10
  moisture
    hydraulic conductivity 229, 266–7
    meso-scale circulation model 241–8
    observations 319
    and root functions 155–6
    variability 296, 300–1, 337
  pores 264–5
  structure 264–6
  surface temperature 168, 290–1
  variability factors, and crop models 273, 279, 280, 285–6, 290–1
soil–vegetation–atmosphere transfer (SVAT) 229–49, 295–6, 336, 347–8
solar radiation, and crop growth rates 288, 290
spatial averages 255–6
spatial correlation 255–6
spatial coverage in remote sensing 46–7, 62–7
spatial data generalisation 183–92
spatial dependence 35–56
spatial heterogeneity and variability 254–6, 264–6
  in EF data 331–4
  in landscape ecology 185–8
  in roots 161–6
  in stomatal characteristics 137–42, 146–7
  in vegetation sampling 254–6
  within-field 274, 282–3
  within-region 274–7
spatial resolution in remote sensing 62–4, 69, 71–6, 176–83
spatial scaling processes 81, 264–6
spatial and temporal scaling 266–7, 375
species variation study 116–22
spectral separability of forest regeneration stages 214–22
SPOT *see* Systeme Probatoire pour l'Observation de la Terre
starch iodine tests 132
stomata 8, 10, 11

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-47109-1 - Scaling-Up: From Cell to Landscape
Edited by P. R. van Gardingen, G. M. Foody and P. J. Curran
Index
More information

conductance 337–44, 352–7
control 334
data presentation 136–7
variation of characteristics 86–99, 129–47
whole-leaf level 129–47
subpixel calibration 178–80
subsistence agriculture 19–20
sugar beet crop models 289
SUITS 81
support *see* spatial resolution
surface albedo 61, 173, 229, 247, 349
surface fluxes
modelling 229–49, 300
observations 319, 320, 347
surface heat flux *see* heat flux modelling
surface momentum *see* momentum flux modelling
surface parameters 61, 229–49; *see also* land surface parameterisation
surface partition into modelling units 304–8, 310–13, 315
surface roughness 173
length 229, 238, 349
variation 234–5
surface states 319
surface temperature
and crop models 285, 288, 290
modelling 234–6
predicting plant community responses 108–9, 123
see also heat flux; soil surface temperature
SVAT *see* soil–vegetation–atmosphere transfer
synthesis, scientific 13
system modelling
land and rural systems management 19–33
to reverse reductionism 26–32
Systeme Probatoire pour d'Observation de la Terre (SPOT) 36, 62, 64, 175
SPOT HRV (Haut Resolution Visible) 177

Television and Infrared Observation Satellite (TIROS) series 36
temperature *see* soil temperature; surface temperature
temporal heterogeneity and variability 256, 257–64
energy partition 327–31
roots 162–6
stomatal conductance 142–3, 146
temporal scaling-up 81, 375
model 208
and spatial scaling 266–7, 375
termites 9–10
terrain information sources 301
Thematic Mapper (TM) sensor data 36, 64, 67, 73, 201, 214, 221, 302, 303, 308
TIGER *see* Terrestrial Initiative in Global Environmental Research
tile methods 236–7, 243–7
TIROS *see* Television and Infrared Observation Satellite
TM *see* Thematic Mapper
TOP-MODEL 300
transpiration 86–99, 146–7, 319, 343; *see also* evapotranspiration; stomata
trialling, empirical, in set-aside 24–5
Trifolium repens 159
tropical forests
carbon balance and budgets 201–22
deforestation 203, 204–5
regeneration 207–22
tropical plantation economies 20
tundra 12
turf, resistence and resilience 112–16

Urtica dioica 109
UK Meteorological Office Low Resolution (UKMO-LO) GCM 260, 264
Ulmus glabra 142
uncertainty in system models 31–2
Unified Forecast/Climate Model 240
univariate distribution function (UDF) 54

vacuum infiltration 132–3
valley flows 239
vapour pressure deficit–conductance relationship 337–9
variability 253–6
amplitude and frequency 257–60
extrinsic and intrinsic mechanisms 267–9
see also spatial heterogeneity and variability; temporal heterogeneity and variability
variation
in aerodynamic resistance/conductance 234
plant to community level 108–16, 122–4
regional and national floras 116–24
in remote sensing 40–7, 62–76
root systems 153–9
stomatal characteristics at whole-leaf level 129–47
variograms 41–54, 69, 71
VEGETATION 176, 191
vegetation
modelling techniques 374
monitoring and mapping 35–6
remote sensing 61–76, 173–92
patch to GCM grid scale 237–49
response prediction 105–24
roadside survey 109

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-47109-1 - Scaling-Up: From Cell to Landscape
Edited by P. R. van Gardingen, G. M. Foody and P. J. Curran
Index
More information

vegetation (*cont.*)
types, and GCMs 229–30, 349
see also canopy; crops; forest; land surface
Vicia faba 143, 337–8
Vismia 215

water exchange process 295–6
water flux 79, 129, 207, 351
modelling 229, 297, 351
watershed processes, scaling behaviour of 295–315
weather
extreme events 262, 363, 372
predicting plant community responses 112–16, 123
forecasting 348
generator, stochastic 263, 291
variability, and crop growth 260–4, 288–91
weeds, in set-aside 24
wetness index 302, 305, 307–8, 314
wheat
field variability 274–83
growth stages 274–5
phenology 274–7, 281–3
physiolical process variability 278–80
yield predictions 261–4, 278–81
wind speed
and aggregation 237
and crop models 290
WOFOST crop model 273, 280
woodland
Biotron study 161–6, 168
photosynthate production 152
see also forest ecosystems
World Climate Programme (WCP) 371

Xanthemum strumarium 141

Zea mays see maize

© in this web service Cambridge University Press www.cambridge.org