A	perimeter, 25
AMPL, 9, 146	progressive protection over time, 12
	proximity, 25
В	Carbon
Biodiversity reservoirs, 109	captation and sequestration, 270, 292
connexion, 108	optimal reserve, 293
connexion at the lowest cost, 111	Climate change, 269
Biological corridor, 107	definite and known evolution, 272,
barrier effect, 121	278, 279, 280
climate change, 108	goal programming, 279, 280, 284
$\cos t$, 109	optimal reserve, 272, 285, 289, 290
design of an optimal network, 109	prediction, 272
disadvantage, 108	review of earlier decisions, 284
graph optimization, 112	robust reserve, 285, 289
grizzly bear movement, 113	scenario, 285, 287
length, 113	scenarios with probabilities, 290
Markov chain, 118	mathematical expectation, 290
mortality risk, 108, 121	Compactness, 57
network permeability, 117	indicator, 57, 59, 60
problem, 107	optimal reserve, 60, 63
restoration, 117	Connectivity, 37
	approximate solution, 43
C	constraint generation approach, 48
Candidate zones for protection, 1	flow approach, 45
adjacency, 38	graph formulation, 38
area, $2, 25$	mandatory zone, 40, 47
associated graph, 39, 74	multiflow approach, 47
cluster, 5, 8	optimal reserve, 40, 42, 46, 47, 48
cost of protection, 1, 2	outside the reserve, 71, 75
distance between zones, 24	CPLEX, 9
isolated, 76	D.
isolating, 76	D
isolation, 25, 26	Disease transmission, 23
level of protection, 1, 17	Diversity, 245
non-disjoint, 98	difference between DNA sequences,
non-disjoint, 90	248

dissimilarity, 247 evenness index, 251 optimal reserve, 247, 252, 255 Shannon–Wiener index, 255 Simpson index, 251 F Forest exploitation	K Kinship, 260 average, 260 coefficient, 260 founder population, 262 generated population, 262 optimal reserve, 263
connexion probability of parcels, 93 cut zones, 87, 93 edge effect, 86, 87 uncut zones, 87, 93 Fractional programming, 26, 31, 311 Dinkelbach algorithm, 28, 31, 65, 311	L Landscape fragmentation, 23 cost, 24 measure, 24 Mean Nearest Neighbour Distance, 24 Mean Proximity Index, 25
hyperbolic programming, 311 in Boolean variables, 253 Function concave, 194, 253, 316 logarithmic, 96 piecewise linear, 194, 313 quadratic, 302	Mean Shape Index, 25 Mean Shape Index, 25 minimization, 26, 28, 31 presentation, 23, 107 Linear programming bicriteria, 293 in Boolean variables, 49, 61, 63, 75, 84, 103, 112, 132, 133, 134, 142, 174,
quadratic convex, 309 G Goal programming, 288, 292 Graph, 327 arborescence, 39, 41, 45, 48, 200, 329 associated with zones, 38, 112 bipartite, 89 centre, 72	176, 184, 185, 216, 291, 300 in integer variables, 183, 286, 300 continuous relaxation, 90, 301 totally unimodular matrices, 300 in mixed-integer variables, 8, 40, 42, 46, 47, 48, 87, 89, 97, 120, 156, 186, 212, 259, 299 set-covering problem, 5, 171, 325 set-partitioning problem, 325
connected, 328 diameter, 57, 328 eccentricity, 72 flow, 45, 112, 330 induced sub-graph, 328 multiflows, 47 radius, 72 root, 40, 42, 45, 72 spanning tree, 73, 329 Steiner tree, 112, 330 strongly connected, 328 transportation network, 330 tree, 72, 329 vertex-edge incidence matrix, 89	M Markov chain, 118, 332 absorbing state, 333, 334 absorption, 334 associated graph, 333 limiting distribution, 333 transient state, 334 transition probability, 333 Matrix minor, 89 totally unimodular, 89 transition probabilities, 118 vertex-edge incidence, 89
without circuits, 40 I Invasive species, 23 IUCN, 1, 205	N Noah's Ark approximate solution, 208, 212 generalized problem, 211

problem, 207	R
Non-linear programming	Replication, 5, 173
approximate solution, 144, 195, 208,	Reserve
220, 226, 240	area, $28, 58, 59$
approximation, 96	basic models, 3
in Boolean variables, 132, 134, 142,	boundary, 57
208, 211, 219, 225, 255	buffer part, 81, 82
in mixed-integer variables, 18, 95, 100,	central part, 81
191, 252, 257	compact, 57
linearization, 101, 134	connected, 37
relaxation, 194	connected and compact, 66
,	diameter, 57, 59
P	distance between zones, 59
Phylogenetic diversity, 199	eccentricity, 71
definition, 199, 200	ecological benefit, 17
expected, 203, 217	expected number of surviving species
greedy algorithm, 203, 209	142
influence of the initial survival	goal programming, 272
probability values, 209	mandatory zone, 15, 42, 47
optimal reserve, 215, 217, 223, 230,	number of protected species, 2, 12
235	perimeter, 57, 58, 59
ordered weighted average, 232	radius, 71
reserve close to an optimal reserve, 220	regret, 175, 194
robust, 231	robust, 152, 154, 157, 170, 173, 175,
scenario, 224	182, 184, 185, 188, 191, 194
uncertain survival probability, 223	SLOSS debate, 23
uncertainty in the tree, 230	spatial configuration, 23, 81
variance, 205, 214	species richness, 2, 7
Phylogenetic tree, 199	survival probability, 132
branch, 200	worst-case scenario, 174, 182, 191
branch length, 200	Robustness in mathematical
evolutionary history, 199	programming, 318
root, 200	interval approach, 319
ultrametric, 200	scenario approach, 322
uncertainty, 230	
	\mathbf{S}
Q	Scenario, 169, 181, 285
Quadratic programming, 302	probability, 290
convex, 253, 263, 303, 308, 309	regret, 175, 185, 194, 289
convex continuous relaxation, 304	robust reserve, 170
convexification, 308	survival probability, 181
eigenvalues, 309	worst-case, 173, 182, 183, 184, 185,
in Boolean variables, 305	191, 194
in mixed-integer variables, 119	Set covering problem, 325
linearization, 65, 120, 259, 305	Set-partitioning problem, 325
positive semidefinite matrix, 303	Species
pre-treatments, 310	evolutionary history, 199