

Index

Index for Connectivity Conservation

- Accipiter gentilis* (Northern goshawk) 603
Actinidia chinensis; *A. deliciosa* (kiwifruit) 269–73, 275–80
 actual connectivity 3
 adder (*Vipera berus*) 82
Aepyceros melampus (impala) 89
 African wild dog (*Lycaon pictus*) 608
 Africanized bee (*Apis mellifera*) 452
Alasmidonta heterodon (dwarf wedge mussel) 243, 245
Alces alces (moose) 136, 603
 alewife (*Alosa pseudoharengus*) 246
 almond (*Prunus dulcis*) 273–4, 275–80
Alopex lagopus (arctic fox) 145
Alosa pseudoharengus (alewife) 246
Amblyrhynchus cristatus (Galapagos marine iguana) 114
 American lobster (*Homarus americanus*) 199
 American marten (*Martes americana*) 603
 American redstart (*Setophaga ruticilla*) 160, 172, 173–5
 AMOVA (analysis of molecular variance) 323
 animal movement
 and functional connectivity 343–6
 avoidance responses 345
 detection space 344
 effects of human-made (or built) objects 344–5
 fields (continuous landscape variation) 344
 goal-directed 343
 individual-based processes 346
 modeling case study: puma in Southern California 356–65
 models of movement 345–6
 object (landscape feature) orientation 344
 perceptual range 344
 spatial variation 344
 statistical models 346–56
 anther smut fungus (*Microbotryum violaceum*) 495
 anthropogenic alterations, impacts on land-water interface connectivity 118–20
Antilocarpa americana (pronghorn antelope) 594, 598, 599
 anurans, ontogenetic habitat shifts 108–9
Apis mellifera (Africanized bee) 452
Apis mellifera (European honeybee) 257–8
 see also pollination of agricultural crops
 Arctic fox (*Alopex lagopus*) 145
 Arctic tern (*Sterna paradisaea*) 157
 Argentine ant, invasive species in North America 464, 465
Aristichthys nobilis (bighead carp) 246
Arundo donax (giant reed) 573
 asymmetrical landscape connectivity 32–4
 Atlantic bluefin tuna 216, 226
 Atlantic cod (*Gadus morhua*) 193–4
 Australian biodiversity conservation
 anthropogenic disturbance 654–5
 anticipating change 665–6
 coastal zone fluxes 656–7
 conservation phases 661–2
 consideration of the landscape as a whole 649–50

- Australian biodiversity conservation (*cont.*)
 - continent-wide WildCountry conservation plan 650
 - core area enhancement 662–3
 - critical connectivity-related phenomena 652–66
 - critical species (keystone species) interactions 652–3
 - cross-cutting connectivity issues 658–66
 - disturbance at local and regional scales 654–5
 - effects of climatic variability 654
 - effects of fire 654, 655, 658
 - future effects of global climate change 655–6
 - hydroecology 656
 - integration of critical connectivity-related phenomena 658–66
 - landscape connectivity 649–50
 - landscape permeability 649–50
 - long-distance biological movement 653–4
 - management of the matrix 663–4
 - need for large-scale ecological connectivity 649–51
 - protection of refugia 654, 658
 - rainfall variability and water availability 653, 656
 - range expansion 657–8
 - scale and context issues 660–1
 - spatial and temporal analyses 664–5
 - spatially dependent evolutionary processes 657–8
 - strongly interacting species 652–3
 - threats to long-term biodiversity conservation 649–50
- badger (*Taxidea taxus*) 565
- Balaena mysticetus* (bowhead whale) 170
 - stable isotope studies 217
- Balaenoptera musculus* (blue whale) 227
- bald eagle (*Haliaeetus leucocephalus*) 113, 244, 245
- beaver (*Castor canadensis*) 109, 136
- bees *see* pollination of agricultural crops
- bighead carp (*Aristichthys nobilis*) 246
- bighorn sheep (*Ovis canadensis*) 91, 594
- biodiversity conservation
 - consideration of the landscape as a whole 649–50
 - maintenance of movements and flows at all scales 649–50
 - need for large-scale connectivity 649–51
- biodiversity conservation corridors
 - alliances across institutions and regions 638–9
 - broader focus of conservation planning 623–4
 - compatible land uses 627–8, 630–1
 - connectivity network 627, 629–30
 - definition and functions 624–6
 - design 626–38
 - economic incentives for stakeholders 637–8
 - elements to be included 627–31
 - expansion of the conservation approach 621–3
 - financial tools and mechanisms 643–5
 - governance 636–7
 - identification of conservation priorities 632
 - implementation challenges and opportunities 636–8
 - implementation tools and approaches 638–42
 - importance of the matrix 630–1
 - incentives and enforcement 641–2
 - institutional capacity-building 639
 - integration of conservation needs and economic development 623–4
 - managing and coordinating corridor initiatives 636
 - multi-stakeholder management institutions and committees 639–40
 - participatory processes 631
 - property rights and community values 637–8
 - protected area system 627, 628–9
 - regional-scale approach 620–3
 - relation to biosphere reserve concept 628
 - revealing and using the economic value of conservation 643–5
 - selection of area and delineation of boundaries 631–4
 - socio-economic factors 634–5
 - spatial modeling 642
 - zoning and enforcement 640–1
- Biological Dynamics of Forest Fragments Project, Brazil 402
- black bear (*Ursus americanus*) 136, 148, 597, 598–9, 601

- black-footed rock wallaby (*Petrogale lateralis*) 77–80
- black rat snake (*Elaphe obsoleta*) 157
- black rhinoceros (*Diceros bicornis*) 82
- black-tailed prairie dog (*Cynomys ludovicianus*) 482–3
- blue whale (*Balaenoptera musculus*) 227
- bobcat (*Felis rufus*) 561
- bobcat (*Lynx rufus*) 548
- Boiga irregularis* (brown tree snake) 452, 453
- bowhead whale (*Balaena mysticetus*) 170
- stable isotope studies 217
- Branta bernicla hrota* (light-bellied brent goose) 169
- Branta ruficollis* (red-breasted goose) 169
- brook charr (*Salvelinus fontinalis*) 327–8, 332
- brook trout (*Salvelinus fontinalis*) 243
- brown bear (*Ursus arctos*) 91, 113 *see also* grizzly bear
- brown tree snake (*Boiga irregularis*) 452, 453
- brown trout (*Salmo trutta*) 331, 333
- buckeye butterfly (*Junonia coenia*) 404–5
- buffalo (*Syncerus caffer*) 89
- buff-breasted sandpiper (*Tryngites subruficollis*) 161
- buffer connectivity measure 45–6, 47, 49–52, 55, 57–9, 65, 306–8, 310–12
- Bufo boreas* (western toad) 565
- Bufo marinus* (giant toad) 456
- bull charr (*Salvelinus confluentus*) 327, 330, 332
- Buteo swainsoni* (Swainson's hawk) 161
- cactus bug (*Chelinidea vittiger*) 33
- California redwood (*Sequoia sempervirens*) 91
- Canadian lynx (*Lynx canadensis*) 91, 603
- landscape network example 432, 433–5, 436
- canine distemper 484
- Canis latrans* (coyote) 145
- Canis lupus* *see* gray wolf; wolf
- Canis lupus dingo* (dingo) 652
- Capra ibex nubiana* (Nubian ibex) 598
- Caretta caretta* (loggerhead sea turtle), life cycle 219–22
- Caribbean National Forest, Puerto Rico, 'protected' area case study 240–1
- caribou (*Rangifer tarandus*) 601
- Castor canadensis* (beaver) 109, 136
- cat (*Felis catus*), in Australia 652
- Catharus ustulatus* (Swainson's thrush) 169
- Catoptrophorus semipalmatus* (western willet) 161–2
- cattail (*Typha* spp.) 246
- Caulerpa taxifolia* (invasive green alga) 202–3, 453–4
- Cervus elaphus* (elk) 594, 598, 599
- Cervus elaphus nannodes* (tule elk) 83
- Chaoborus* spp. (phantom midge larvae) 157
- Charadrius melodus* (piping plover) 161
- charrs (*Salvelinus* spp.) 326–31
- Chelinidea vittiger* (cactus bug) 33
- Chlamydia* spp. threat to koala populations 483
- cholera pathogen transport 247
- chytrid fungus, infection and killing of stream-dwelling frogs 247–8
- Citrullus lanatus* (watermelon) 264–9, 275–80
- Clemmys marmorata* (western pond turtle) 565
- coastal cutthroat trout (*Oncorhynchus clarki clarki*) 327, 329, 330
- coffee (*Coffea arabica*; *C. canephora*) 258–64, 275–80
- connectivity
 - actions to protect and improve habitats 680–2
 - actual 3
 - among different habitats 255–6
 - and biodiversity conservation 7, 9
 - between distinct habitat types 97
 - broadening of the concept 677–8
 - by matrix management 607
 - by means other than corridors 606–8
 - capture and translocation of animals 608
 - concept of 2–5
 - dynamic nature 5
 - functional (or behavioral) component 3
 - habitat mosaics 12
 - in land management 678–9, 680–2
 - in landscape ecology 4
 - in metapopulation ecology 4
 - landscape connectivity concept 4
 - migratory stopovers 12
 - movement in nature 2
 - movement responses to climate change 679–80

- connectivity (*cont.*)
 - potential 3
 - role in conservation biology 677–9
 - role in conservation planning 608–10
 - role in conservation strategy 680–2
 - scale and target dependent
 - phenomenon 2–3, 5
 - stepping stones 12, 607–8
 - structural (or physical) component 3
 - types of movement and connection 12
- connectivity conservation
 - connectivity of communities, ecological
 - processes and ecological flows 683–6
 - effects on genetic variability 9–11
 - future directions and challenges
 - 682–91
 - integration of biological and socio-political issues 686–7
 - key questions and challenges 12–13
 - learning from experience 688–9
 - long-term monitoring of projects 688–9
 - potential advantages and disadvantages
 - 9–12
 - role in strategic planning for
 - conservation 689–91
 - synergy of theoretical, empirical and applied domains 14–17
 - types of movement and connection 12
 - use and effects of corridors 9–12
- connectivity planning
 - biological trade-offs among corridor
 - options 540–3
 - case study: Natural Communities Conservation Planning 549–51
 - case study: Santa Clara River valley
 - 546–9
 - case study: Tenaja Corridor 543–6
 - connectivity conservation in practice
 - 551–3
 - difficulties caused by resource
 - limitation 538–40
 - feasibility considerations 541–3
 - guidelines for improving methods
 - 609–10
 - high real cost of corridor
 - implementation 538–9
 - Missing Linkages analysis 546
 - opportunity costs of corridor
 - implementation 539
 - prioritization among corridor options
 - 539–40
 - processes involved 537–8
 - relative likelihood of successful
 - implementation 541–3
 - resource investment decision-making
 - 537–40
 - risks associated with corridor
 - implementation 539
 - wildlife corridor planning 536–7
 - see also* corridor identification and design; linkage planning
- connectivity-related phenomena, Australia
 - 652–66
- connectivity research
 - conservation implications 26–7
 - conservation value of the matrix 23–4, 26–7
 - corridor studies 5–7, 8
 - effects on evolutionary diversification
 - 26
 - effects on genetic diversity 25–6
 - functional connectivity 24, 25
 - habitat fragmentation threshold 23
 - habitat loss effects 23
 - historic trends 5–7, 8
 - integration of theoretical, empirical and applied studies 679–80
 - island biogeography theory 23
 - issues and challenges 23–7
 - landscape ecology 24
 - landscape mosaics 23–4
 - metapopulation theory 24, 27
 - movement by diffusion 25
 - movement by dispersal 25
 - movement consequences 25–6
 - movement facilitators and barriers 24–6
 - patch-matrix view 23, 24, 27
 - recent increase in 5–7, 8
 - relevance of models and theories 27
 - scale appropriate to the organism 25
 - speciation effects 26
 - structural connectivity 24, 25
 - when connectivity really matters 26
- conservation biology
 - conservation implications of
 - connectivity 26–7
 - emergence and growth of the discipline
 - 676–7
 - role of connectivity 677–9
- Conservation International 621, 644
- conservation planning, role of
 - connectivity 608–10 *see also* connectivity planning; corridor identification and design

- conservation value of the matrix 23–4, 26–7
- corridor effects on populations and communities
 - confounding effects in studies 398–9
 - evidence for 392–6
 - large-scale landscape manipulation studies 402–5
 - linkage across life-history and trophic levels 405–7
 - microcosm studies 399
 - model-directed experimental research 407–10
 - movement effects 390–1
 - potential negative effects 391
 - potential positive effects 391
 - research approaches 399–410
 - review of studies 392–6
 - spatial and temporal scale effects 396–8
 - species-specific effects 396
 - studies of corridors as conduits for rare events 400–2
 - study design 396–9
 - theoretical predictions 399
 - use and effects in connectivity conservation 9–12
 - variability of environmental effects 398–9
- corridor identification and design
 - broad-scale corridors 588–606
 - combinations of expert-based approaches 594–6
 - combined approaches 589–90
 - empirical and modeling approaches 597–606
 - guidelines for improving methods 609–10
 - life-history requirements of species 589
 - modeling and empirical approaches 597–606
 - only remaining routes 591–2
 - routes based on expert knowledge of focal species 593–4
 - routes based on least-cost path analysis 602–5
 - routes based on observations of animal presence, movements or signs 597–601
 - routes based on radiotelemetry and other markings of animals 601–2
 - routes based on spatially explicit population models (SEPMs) 605–6
 - routes incorporating sites of conservation interest 592–3
 - ‘seat-of-the-pants’ approaches 590–6
 - shortest or most direct routes 591
 - see also* connectivity planning
- corridor studies 5–7, 8
- corroboree frog (*Pseudophryne corroboree*) 74
- cougar (*Felis concolor*) 148
- coyote (*Canis latrans*) 145
- Crassostrea* spp. (oysters) 457
- Cynomys ludovicianus* (black-tailed prairie dog) 482–3
- Dall sheep (*Ovis dalli*) 601
- Daphnia* (water fleas) 84
- Daphnia galeata* 242–3
- deer mouse (*Peromyscus maniculatus*) 498
- desert tortoise (*Gopherus agassizii*) 602
- Diceros bicornis* (black rhinoceros) 82
- diffusion 25
- dingo (*Canis lupus dingo*) 652
- Diplodus sargus* (white sea bream) 498
- disease
 - connection between infected and susceptible hosts 480
 - effects of habitat fragmentation 479
 - effects of increased connectivity 479
 - epidemic control models 481
 - evidence for effects of habitat fragmentation 481–4
 - host-pathogen network models 480–1
 - host-pathogen SIR (susceptible, infected, resistant) models 480–1
 - pathogen adaptation to patchy habitats (hosts) 479
 - pathogen transmission stages 479
 - threshold transmission rate 480–1
- disease and connectivity
 - black-tailed prairie dog colony extinction by plague 482–3
 - canine distemper 484
 - endemic pathogens 491–4
 - introduced pathogens or reservoirs 494
 - measles 484
 - metapopulation models of disease and endangered species 490–4
 - models of pathogen-induced extinction risk 490–4
 - phocine distemper in seals 484–90
 - rates of disease spread in marine systems 483–4

- disease and connectivity (*cont.*)
 - reservoir species 490
 - rinderpest 484
- disease and habitat fragmentation
 - Chlamydia* spp. threat to koala populations 483
 - genetic resistance to pathogens 494–7
 - implications for design of nature reserves 498
 - Lyme disease 481–2
 - parasites and pathogens in nature reserves 498
 - pathogen persistence 485–90
 - pathogen persistence models 486–90
 - reservoirs of disease 482
 - zoonotic viral diseases 481–2, 483
- dispersal 25
- dispersal mortality 38–9
- DNA microsatellite markers 322
 - assignment tests 324–6
 - coalescent-based methods 324, 325
 - connectivity and patterns of genetic variability 322–6
 - data analysis and interpretation 323–6
 - estimation of asymmetrical migration 324, 325
 - estimation of dispersal patterns 325
 - estimation of rates of dispersal 324, 325
 - individual-based analyses 323, 324–6
 - phenograms ('trees') 323
 - predefined population-based analyses 323–4, 325–6
 - salmonid connectivity case studies 326–31
- Dreissena polymorpha* (zebra mussel) 246, 452, 458, 464
- Drosophila* (fruit flies) 84
- dwarf wedge mussel (*Alasmidonta heterodon*) 243, 245
- Ebola virus 498
- Echinogammarus ischnus* (amphipod) 246
- ecosystem services
 - crop pollination 256–7 *see also*
 - pollination of agricultural crops
 - definition 256
 - economic value 256
 - effects of habitat connectivity 256–7
 - functional connections between source and recipient 256–7
 - scope and diversity 256
- effective distance (cost-weighted distance) 418–19
 - allocation zones (Voronoi or Thiessen polygons) 423, 424
 - computation 419–20
 - graph (network) theory 428–35
 - least-cost distance 420–3
 - least-cost path 423–5
 - multiple pathways 425–8
 - Nth-optimal corridor 427–8
 - outputs from cost-weighted methods 420–8
- Elaeidobius kamerunicus* (weevil) 274–5
- Elaeis guineensis* (oil palm) 274–80
- Elaphe obsoleta* (black rat snake) 157
- elephant (*Elephas maximus*) 595
- elk (*Cervus elaphus*) 594, 598, 599
- Epinephelus striatus* (Nassau grouper) 201
- Eucalyptus phylacis* (Meelup mallee tree) 91
- Euphydryas aurinia* (butterfly) 56
- Euphydryas maturna* (butterfly) 56
- Euptoieta claudia* (variegated fritillary) 404–5
- Eurasian oystercatcher (*Haematopus ostralegus*) 164
- European honeybee (*Apis mellifera*) 257–8
 - see also* pollination of agricultural crops
- evolutionary consequences of habitat fragmentation 92
- evolutionary diversification, connectivity research 26
- extinction debt 34–5
- extinction risk, genetic factors in small populations 72–5
- extinction thresholds for species 34–5
- extinction vortices 9
- F* statistics 86–90, 323–4
- Felis catus* (cat), in Australia 652
- Felis concolor* (cougar) 148
- Felis concolor* (mountain lion) 541, 548
- Felis rufus* (bobcat) 561
- Fender's blue butterfly (*Icaricia icariodes fenderi*) 33
- fire ant (*Solenopsis invicta*) 452
- Florida black bear (*Ursus americanus floridanus*) 605
- Florida panther (*Puma concolor coryi*) 605
- flour beetles (*Tribolium*) 84
- flying foxes (*Pteropus* spp.), zoonotic viral diseases 483

- Forestry Commission, land management strategy 35–6
 fox (*Vulpes vulpes*) 652
 FRAGSTATS 24
 freshwater mussel species, decline 244–5
 fruit flies (*Drosophila*) 84
 functional connectivity 3
 and animal movement 343–6
 and landscape resistance 418
 conceptual development 416–18
 connectivity research 24, 25
 effective distance among patches 418–20
 influence of matrix heterogeneity 417, 418
 least-cost path analysis 418–19
 measurement 30–2
 types and scales of movements 417–18

Gadus morhua (Atlantic cod) 193–4
 Galapagos marine iguana (*Amblyrhynchus cristatus*) 114
 Galapagos sea lion (*Zalophus wollebaecki*) 115
Gallinula chloropus guami (Mariana moorhen) 161
 gene flow measurement 86–91
 assignment tests using multiple genetic loci 88–9
 coalescence approaches 89
 detection of recent immigrants 88
 dispersal and gene flow 89–91
 F statistics 86–90
 genetic distances 89
 geographic distance and genetic differentiation 89–91
 historical gene flow indicators 88–9
 migration-inbreeding equilibrium 87–9
 gene flow patterns, and population structures 75–86
 genetic differentiation, and geographic distance 89–91
 genetic diversity, connectivity research 25–6
 genetic impacts of habitat fragmentation 72–5
 completely isolated fragments 77–82
 effects of gene flow patterns 75–86
 effects of population structures 75–86
 effects of small population size 72–5
 evolutionary consequences 92
 extinction risk 72–5

 gene flow required to connect fragments 84–5
 in asexual species 91
 in haploid species 91
 in polyploid species 91
 in self-fertilizing species 91
 inbreeding depression 72–3
 loss of genetic diversity 72–3
 loss of self-incompatibility alleles 72, 73–4
 metapopulations 76
 modeling 82–4
 mutation accumulation 72, 74
 outbreeding depression 72, 74–5
 partially connected fragments 82–4
 recovery following outcrossing 84
 reduced ability to adapt to environmental change 72, 73
 genetic methods, population connectivity assessment 86–91
 genetic resistance to pathogens, and habitat fragmentation 494–7
 geometric tortoise (*Psammodromus geometricus*) 88–9
 giant kelp (*Macrocystis pyrifera*) 191
 giant reed (*Arundo donax*) 573
 giant toad (*Bufo marinus*) 456
 Glanville fritillary butterfly (*Melitaea cinxia*) 55, 56, 57–9, 61–2
 inbreeding and extinction risk 76, 82
 global change, effects of 39–40
Gopherus agassizii (desert tortoise) 602
 graph (network) theory 428–35
 landscape networks 429–35
 grassland daisy (*Rutidosia leptorrhynchoides*) 74, 82, 83
 gray fox (*Urocyon cinereoargenteus*) 548
 gray wolf (*Canis lupus*) 91
 population connectivity and viability models 370–1, 374–83
 see also wolf
 gray wolf (*Canis lupus*) (coastal islands, Canada) 130–49
 ability to swim in open ocean 134–5, 142, 143
 adaptation to local conditions 134
 black-tailed deer (*Odocoileus hemionus*) prey 132, 136, 137–8, 145–7
 coastal island archipelago (British Columbia) 130–2, 133
 diversity of habitats 134

- gray wolf (*cont.*)
 - effects of food resource availability 145–7
 - effects of island isolation 143–4
 - effects of island shape and orientation 144–5
 - effects of island size 142–3
 - food resources and connectivity 145–7
 - food supplements from the ocean 147
 - geographic range of the species 132, 134–5
 - Great Bear Rainforest 149
 - island communities and species composition 130–2, 133
 - movement among habitat patches 130–49
 - patch (island) choice factors 141–9
 - potential prey base in study area 136
 - predator-prey dynamics on isolated islands 145–6, 148
 - prey resource availability 137–8
 - salmon (*Oncorhynchus* spp.) prey 136, 137, 147
 - study area 133, 135–6
 - study methods 136–9
 - study results 139–41
 - study statistical analyses 138–9
 - travel and dispersal distances 134–5
- Great Lakes
 - introduction and spread of exotic species 242–3, 245–6
 - transport of bioaccumulated toxic chemicals 245
- greater prairie chicken (*Tympanuchus cupido pinnatus*) 82, 84
- greenback cutthroat trout (*Oncorhynchus clarki stomias*) 243–4
- grey seals, phocine distemper epidemic 484–90
- grizzly bear (*Ursus arctos*) 135, 148, 244, 418, 595, 601, 603
 - population connectivity and viability models 370–1, 374–80
 - see also* brown bear
- Grus americana* (whooping crane) 608
- Gulo gulo* (wolverine) 603
- Gymnoblanius leadbeateri* (Leadbeater's possum) 658
- gypsy moth (*Lymantria dispar*) 452
- habitat connectivity (different habitat types) 97
 - at boundaries between different habitats 98
 - behavioral linkages 100–1
 - biotic/abiotic mediation of linkages 102–3
 - boundary characteristics 113, 114–16
 - conceptual framework 99–104
 - considerations for ecology 116–18, 121–3
 - definition of habitat linkages 98–9
 - demographic (population) linkages 100
 - directionality of movement 102
 - dynamical features 101–4
 - environmental linkages 100
 - examples of land-water interface linkages 103–9
 - factors promoting and limiting linkages 113–16
 - feedback between systems 102
 - functional connections 100–1
 - genetic linkages 101
 - mediation of freshwater-terrestrial linkages 103
 - mediation of marine-terrestrial linkages 103
 - primary effects 100–1
 - secondary and indirect effects 101
 - temporal variation in linkages 102
 - trophic linkages 100
 - units of flux 99–100
- habitat fragmentation 1
 - and biodiversity 7, 9
 - evolutionary consequences 92
 - extinction vortices 9
 - genetic impacts 72–5
 - isolation effects 7, 9
 - naturally fragmented landscapes 13
- habitat fragmentation threshold 23
- habitat loss effects 23
- habitat mosaics 12
- Haematopus ostralegus* (Eurasian oystercatcher) 164
- Haliaeetus leucocephalus* (bald eagle) 113, 244, 245
- harbour seals, phocine distemper epidemic 484–90
- harp seals, phocine distemper 484
- Hendra virus 483
- Herpestes javanicus* (mongoose) 454, 456
- Homarus americanus* (American lobster) 199
- housefly (*Musca domestica*) 84
- humans (*Homo sapiens*)

Cambridge University Press

978-0-521-67381-5 - Connectivity Conservation

Edited by Kevin R. Crooks and M. Sanjayan

Index

[More information](#)

Index | 703

- anthropogenic influences on invasion
 - rates 459–63
- increase in emerging zoonotic viral diseases 483
- population growth 1
- hydrologic connectivity
 - connectivity research in river ecosystems 234–6
 - definition 233
 - effects of human alterations 233–4
 - effects of hydrologic disturbances 236–9
 - fragmentation of freshwater ecosystems 234
 - hydrologic cycle 237
 - hydrologic disturbances in biological reserves 236–9
 - importance to conservation biology 236–9
 - interactive pathways of rivers 236
 - pressure on water resources 239
 - proliferation of exotic species 238–9
 - 'protected' area case study: Caribbean National Forest, Puerto Rico 240–1
 - upstream and downstream disturbances 238–9
- hydrologic connectivity alterations
 - contamination crisis in US wildlife refuges 248–9
 - cumulative effects of anthropogenic alterations 246–9
 - dispersal of exotic species 242–3, 245–6
 - ecological consequences 241–6
 - ecosystem and landscape-level changes 244–6
 - emerging environmental challenges 246–9
 - genetic and species-level effects 241–3
 - PCB 'hotspots' 247
 - PCBs in the Arctic food web 247
 - population and community-level changes 243–4
 - transport of bioaccumulated toxic chemicals 245
 - transport of pathogens 247–8
 - transport of persistent organic pollutants 247
 - transport of resistant bacteria and resistance genes 247
 - wildlife impacts of wetlands
 - contamination and loss 248–9
- Hymenoxys acaulis* var. *glabra* (lakeside daisy) 74
- hyperconnectivity
 - anthropogenic influences on invasion rates 459–63
 - control of spread of invaders 464
 - definition 453
 - ecosystem modification by established exotics 467
 - ecosystem quality and invasion success 465–6
 - genetic effects on invader populations 463–4
 - human-mediated jump-dispersal events 464
 - implications for conservation and management 467–70
 - increase in invasion rates over time 459–61
 - 'invasional meltdown' 467
 - invasive species-specific connectivity 466–7
 - link between invasions and trade 461–2
 - patterns of vector operation 457–8
 - population dynamics of established invaders 463–4
 - prediction of timing of species invasion 458–9
 - process of movement by vectors 456–7
 - proliferation of invasion vectors 453–9
 - rate of local appearance of new species 462–3
 - temporal patterns of invasion in Japan 457
- Hypophthalmichthys molitrix* (silver carp) 246
- Iberian lynx (*Lynx pardinus*) 33
- Icaricia icariodes fenderi* (Fender's blue butterfly) 33
- IFM (incidence function model)
 - connectivity measure 31, 45–6, 47–52, 55, 57–9, 64–5, 306–8, 310–12
- IFM-Q model 57–9, 64–5
- impala (*Aepyceros melampus*) 89
- incidence function model *see* IFM

- individual-based movement simulations
 - 352–6
 - animal component 353
 - case study: carnivore movement in Southern California 356–65
 - conservation applications 356
 - evaluating functional connectivity 354–6
 - landscape component 352–3
 - objectives for connectivity conservation 362–5
 - running a simulation 353–4
 - simulation control component 353
 - structure 352–3
 - see also* statistical models of animal movement
- inter-habitat connectivity 97
- invasive species
 - anthropogenic influences on invasion rates 459–63
 - anthropogenic transport mechanisms 452
 - conservation and management implications 467–70
 - control of spread of invaders 464
 - economic costs 452
 - ecosystem damage 452
 - ecosystem modification by established exotics 467
 - ecosystem quality and invasion success 465–6
 - effects on small-scale diversity 452–3
 - examples 452
 - genetic effects on invader populations 463–4
 - global biotic homogenization 452
 - global species movement 451–3
 - human-mediated jump-dispersal events 464
 - hyperconnectivity 453
 - in highly-modified habitats 453
 - increase in invasion rates over time 459–61
 - intentional introductions 454–6
 - invasion vectors 452, 453–9
 - ‘invasional meltdown’ 467
 - invasive species-specific connectivity 466–7
 - landscape-level effects 453
 - link between invasions and trade 461–2
 - loss of large-scale diversity 452
 - negative consequence of connectivity 451–3
 - patterns of vector operation 457–8
 - population dynamics of established invaders 463–4
 - prediction of timing of species invasion 458–9
 - problems with biological controls 454–5
 - process of movement by vectors 456–7
 - rate of local appearance of new species 462–3
 - unintentional introductions 455, 456
- Ipomopsis aggregata* (scarlet gilia) 82
- island biogeography theory 23, 131
- island communities *see* gray wolf (*Canis lupus*) (coastal islands, Canada)
- isolation effects 7, 9
- Isotoma petraea* 92
- Junonia coenia* (buckeye butterfly) 404–5
- Kermode black bear (*Ursus americanus kermodei*) 135–6
- kiwifruit (*Actinidia chinensis*; *A. deliciosa*) 269–73, 275–80
- koala populations, extinction threat from *Chlamydia* spp. 483
- kudzu (*Pueraria montana* var. *lobata*) 452, 454
- Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) 328, 329, 330, 331, 333
- lake trout (*Salvelinus namaycush*) 245–6
- lakeside daisy (*Hymenoxys acaulis* var. *glabra*) 74
- Lamellodiscus elegans* (flatworm parasite) 498
- lamprey (*Petromyzon marinus*) 245–6, 454
- land management, misapplication of theory 30, 31–2, 35–6, 38
- land-water interface
 - aquatic-terrestrial functional connections 98
 - behavioral linkages 100–1
 - biotic/abiotic mediation of linkages 102–3
 - conceptual framework for connectivity 99–104
 - definition of habitat linkages 98–9
 - demographic (population) linkages 100
 - directionality of movement 102
 - diversity of habitat linkages 98
 - dynamical features 101–4

- environmental linkages 100
- feedback between systems 102
- functional connections 100–1
- genetic linkages 101
- importance of the habitats involved 122–3
- mediation of freshwater-terrestrial linkages 103
- mediation of marine-terrestrial linkages 103
- primary effects 100–1
- secondary and indirect effects 101
- temporal variation in linkages 102
- trophic linkages 100
- units of flux 99–100
- land-water interface linkages
 - allochthonous inputs (from outside the system) 104–7, 114, 115–16, 117–18
 - bidirectional flow with feedback 108–9
 - bidirectional flow without feedback 107–8
 - boundary characteristics 113, 114–16
 - common features of different types 110–13
 - considerations for conservation 118–21, 122–3
 - considerations for ecology 116–18, 121–3
 - donor-controlled subsidies 104–5
 - examples 103–9
 - factors promoting and limiting 113–16
 - impacts of anthropogenic alterations 118–20
 - ontogenetic habitat shifts 108–9, 113, 114
 - perspective dependence 111–12
 - ramifying and multiple effects 112–13
 - scale dependence 110–12
 - scale of protected areas and buffer zones 120–1
 - siting of protected areas and buffer zones 120–1
 - unidirectional flow with feedback 106–7
 - unidirectional flow without feedback 104–6
- landscape connectivity 4
 - adaptive management 39–40
 - assessment of 31–5
 - asymmetrical landscape connectivity 32–4
 - corridors 29, 30, 31
 - critical thresholds 34–5
 - definition 29–31
 - directional connectivity 33–4
 - dispersal mortality 38–9
 - dynamic concept 39–40
 - effects of global change 39–40
 - extinction debt 34–5
 - factors affecting movement among patches 30–5
 - functional connectivity measurement 30–2
 - gap-crossing abilities of organisms 30–1
 - incidence function models 31
 - inherently neither good or bad 38–9
 - management for resilience 39–40
 - managing the matrix 31–2, 36–7
 - matrix structure and heterogeneity 32–4
 - neutral landscape models 34, 35, 38
 - non-linear effects 34–5
 - non-random nature of real landscapes 32–5, 38
 - percolation theory 34
 - relationship to population persistence 38–40
 - species extinction thresholds 34–5
 - species-specific connectivity 32–5, 36
 - structural connectivity measurement 30–2
 - theory misapplication in land management 30, 31–2, 35–6, 38
- landscape ecology 4, 24
- landscape mosaics 23–4
- landscape networks 429–35
 - application to conservation planning 437
 - conceptual advances 435, 437
 - example: Canadian lynx in Colorado, USA 432, 433–5, 436
 - graph-theoretic metrics 432–4
 - measures of connectivity 432–4
- landscape permeability 649–50
- Leadbeater's possum (*Gymnodelidius leadbeateri*) 658
- least-cost path analysis 418–19
 - generation of effective distance (cost-weighted routes) 419–20
- leatherback turtle 227 *see also* sea turtles
- light-bellied brent goose (*Branta bernicla hrota*) 169
- linkage planning (South Coast Missing Linkage project) 557–83
 - step 1: build a coalition 558–60

- linkage planning (*cont.*)
 - step 2: select core areas and prioritize linkages 560–3
 - step 3: select focal species for each linkage 563–5
 - step 4: create a detailed linkage design 565–73, 581–2
 - step 5: specify restoration opportunities and management needs 573–5
 - step 6: parcel-level maps and implementation 575–8
 - step 7: design and implement a monitoring program 578–9
 - see also* connectivity planning; corridors
- loggerhead sea turtle (*Caretta caretta*), life cycle 219–22
- Lontra canadensis* (river otter) 136
- Louisiana black bear (*Ursus americanus luteolus*) 601
- Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*) 594
- Lycan pictus* (African wild dog) 608
- Lychnis alpina* 495
- Lymantria dispar* (gypsy moth) 452
- Lyme disease 481–2
- Lynx canadensis* (Canadian lynx) 91, 603
 - landscape network example 432, 433–5, 436
- Lynx pardinus* (Iberian lynx) 33
- Lynx rufus* (bobcat) 548
- Lyssavirus 483
- Lythrum salicaria* (purple loosestrife) 246
- Macrocystis pyrifera* (giant kelp) 191
- Malheur wirelettuce (*Stephanomeria malheurensis*) 91
- Mariana moorhen (*Gallinula chloropus guami*) 161
- marine ecosystems
 - metapopulation-based view of connectivity 184
 - natural fragmentation and patchiness 184
 - phocine distemper in seals 484–90
 - rates of disease spread 483–4
 - see also* oceanic wide-ranging species
- marine invertebrates and fish
 - connectivity patterns in marine environments 184–9
 - dispersal and gene flow by planktonic propagules 184–9
 - planktonic larval stage 184–9
 - post-larval mobility 195–6
 - species with no free-living larval stage 195–6
- marine planktonic propagules (larvae or spores) 184–9
 - assessment of connectivity 189–92, 193
 - factors affecting dispersal potential 189
 - identifying recruit sources 189–92
 - importance of understanding connectivity 189
 - influences on connectivity 192–6
 - larval swimming behavior 194–5
 - methods of measuring dispersal distances 189–92, 193
 - timing of propagule release 192–4
 - vertical migration of larvae 194–5
- marine populations connectivity and biodiversity 203–4
 - conservation implications 198–204
 - ecological results 196–8
 - effects of climate change 198, 199
 - fisheries management 198–9
 - gene flow, drift and selection 197
 - implications 196–204
 - local recruitment vs. high connectivity 203–4
 - marine reserve networks 199–201
 - metapopulation dynamics 197–8
 - prevention and control of invasive species 202–3
 - recruitment dynamics 196–7
 - shifts in patterns 198–9
- marine reserve networks 227
- Martes americana* (American marten) 603
- matrix
 - conservation value 23–4, 26–7
 - management 31–2, 36–7
 - structure and heterogeneity 32–4
- measles 484
- Meelup mallee tree (*Eucalyptus phylaxis*) 91
- Melitaea athalia* (butterfly) 56
- Melitaea cinxia* (Glanville fritillary butterfly) 55, 56, 57–9, 61–2
 - inbreeding and extinction risk 76, 82
- Melitaea diamina* (butterfly) 49–50, 55, 56
- metapopulation capacity 60–2, 308
- metapopulation dynamics
 - comparisons of models 55, 57–9
 - connectivity in biological hierarchies 52–62
 - connectivity measures and colonizations 55–9

- connectivity measures and extinction events 55, 59
- data quality 62–4, 65, 66, 66–8
- explanatory ability of connectivity measures 55, 57–9
- extinction and recolonization events 76
- IFM-Q model 57–9, 64–5
- mortality during migration 53–5, 56
- movements of individuals 53–5, 56
- persistence of species 60–2, 67–8
- prediction using connectivity measures 66–7, 68
- rescue effect of connectivity 59
- virtual migration model 53–5, 56
- metapopulation ecology 4
 - buffer connectivity measure 45–6, 47, 49–52, 55, 57–9, 65
 - definition of connectivity 44–5
 - IFM (incidence function model) connectivity measure 45–6, 47–52, 55, 57–9, 64–5
 - measures of connectivity 45–52
 - nearest neighbour connectivity measure 45–7, 49–52, 55, 57–9, 67
 - species persistence measures 45
 - weaknesses of simple connectivity measures 50–2
- metapopulation models
 - metapopulation capacity and species persistence 60–2
 - modeling extinction and recolonization 59–62
 - parameter estimation 60, 62–4, 65, 66–7
 - stochastic patch occupancy models (SPOMs) 59–62, 62–4, 65
- metapopulation theory 24, 27
 - applied to islands 131
- metric types
 - actual movement 308–12
 - buffer radius connectivity measure 306–8, 310–12
 - graph-theoretic 304–6, 310–12
 - IFM connectivity measure 306–8, 310–12
 - nearest-neighbour distance 299–300, 310–12
 - scale-area slope 302–4, 310–12
 - spatial pattern indices 300–2, 310–12
- metrics for different types of data 299–314
 - combined metrics approaches 313
 - improvement by inclusion of extra data 311–12
 - individual movement data 308–12
 - information content—data requirements trade-off 310–12
 - patch occupancy data and nearest-neighbour distance 299–300, 310–12
 - point or grid-based occurrence data 302–4, 310–12
 - scaling issues in multi-species connectivity 312–13
 - spatially explicit data with dispersal data 304–6, 310–12
 - spatially explicit habitat data 300–2, 310–12
 - spatially explicit patch occupancy, patch and dispersal data 306–8, 310–12
- metrics of connectivity 297–9
 - actual connectivity metrics 298–9
 - class of connectivity quantified 298–9
 - differences in data requirements 299–312
 - level of detail 298
 - potential connectivity metrics 298–9
 - species-centered view 298
 - structural connectivity metrics 298
- Microbotryum violaceum* (anther smut fungus) 495
- microsatellite markers *see* DNA microsatellite markers
- migration mortality 53–5, 56
- migratory behaviour
 - diversity of 157–8
 - effects of physical environment 157–8
- migratory birds 157–8 *see also* migratory connectivity (migratory birds)
- migratory connectivity
 - conservation management implications 160–2
 - definition 158
 - importance of understanding 159–62
 - measurement tools 170–7
- migratory connectivity (migratory birds)
 - allohiemy 160
 - effects of habitat loss 162–9
 - effects on population dynamics 162–9
 - equilibrium population model 162–9
 - factors affecting reproductive success 159–60, 177
 - large spatial scales involved 158–9
 - measurement by ringing and tagging 170

- migratory connectivity (migratory birds) (*cont.*)
 - measurement using molecular genetic techniques 170–1
 - measurement using satellite telemetry 170
 - measurement using stable isotopes in animal tissues 171–3
 - migratory stop over areas 12, 159, 169
 - retention of breeding population structure 159
 - seasonal interactions 159–60, 177
 - statistical methods of estimation 173–7
 - strength of 160
 - synhiemy 160
- migratory stop over areas 12, 159, 169
- mink (*Mustela vison*) 147
- modeling *see* individual-based movement
 - simulations; spatially explicit population models; statistical models of animal movement
- models and theories, relevance of 27
- mongoose (*Herpestes javanicus*) 454, 456
- monitor lizard (*Varanus indicus*) 454, 456
- moose (*Alces alces*) 136, 603
- Morone saxatilis* (striped bass) 245
- mosquitoes, transport in used tires 453
- mountain goat (*Oreamnos americanus*) 136
- mountain lion (*Felis concolor*) 541, 548
- mountain lion (*Puma concolor*) 588–9, 590, 591, 601–2
- movement by diffusion 25
- movement by dispersal 25
- mule deer (*Odocoileus hemionus*) 565, 598, 599
- Musca domestica* (housefly) 84
- Mustela vison* (mink) 147
- Nassau grouper (*Epinephelus striatus*) 201
- nearest neighbour connectivity measure
 - 45–7, 49–52, 55, 57–9, 67, 299–300, 310–12
- Neogobius melanostomus* (round goby) 246
- Neonympha mitchellii francisci* (St. Francis satyr butterfly) 400–2
- network (graph) theory 428–35
 - landscape networks 429–35
- neutral landscape models 34, 35, 38
- Nipah virus 483
- non-random nature of real landscapes
 - 32–5, 38
- northern goshawk (*Accipiter gentilis*) 603
- northern spotted owl (*Strix occidentalis caurina*) 373
- Nubian ibex (*Capra ibex nubiana*) 598
- oceanic wide-ranging species 213
 - coastal and nearshore habitat conservation 226–7
 - connectivity in the ocean 214–15
 - connectivity-related conservation challenges 223–7
 - connectivity research (sea turtle case study) 217–24
 - connectivity research challenges 215–17
 - connectivity research objectives 215
 - conservation informed by connectivity research 226–7
 - conservation status 225–6
 - dispersal of life stages 214
 - dynamic fragmentation and connectivity 224–5
 - extinction threats 225–6
 - factors affecting population connectivity 215
 - fishing policy informed by connectivity research 226
 - genetic measures of connectivity 217
 - levels of genetic differentiation among populations 214
 - marine reserve networks 227
 - migration distances 213
 - patchiness of the oceanic habitat 214–15
 - patterns of connectivity 213
 - permeability of the matrix 214
 - rates of import and export in marine systems 214
 - stable isotope studies 217
 - tagging technologies 215–17
 - see also* marine ecosystems
- Odocoileus hemionus* (black-tailed deer) 132, 136, 137–8, 145–7
- Odocoileus hemionus* (mule deer) 565, 598, 599
- oil palm (*Elaeis guineensis*) 274–80
- Oncorhynchus* spp. (salmon) 113, 119, 136, 137, 147, 198 *see also* salmonid fishes
- Oncorhynchus* spp. (trout) 326–31 *see also* salmon; salmonid fishes
- Oncorhynchus clarkii clarkii* (coastal cutthroat trout) 327, 329, 330
- Oncorhynchus clarkii henshawi* (Lahontan cutthroat trout) 328, 329, 330, 331, 333

- Oncorhynchus clarki stomias* (greenback cutthroat trout) 243–4
Oncorhynchus mykiss (steelhead) 333, 565
Opuntia cactus 33
Oreamnos americanus (mountain goat) 136
Ovis canadensis (bighorn sheep) 91, 594
Ovis canadensis cremnobates (peninsular bighorn sheep) 561
Ovis dalli (Dall sheep) 601
 oysters (*Crassostrea* spp.) 457
- Pacific yew (*Taxus brevifolia*) 87–8
 parasites
 adaptation to patchy habitats (hosts) 479
 viability in fragmented habitats 479
 see also disease
 parasitoids, host switching in Hawaii 454
Parnassius smintheus (butterfly) 55, 56
 PATCH, use in corridor identification and design 605–6
 patch-matrix view 23, 24, 27
 pathogens
 adaptation to patchy habitats (hosts) 479
 viability in fragmented habitats 479
 see also disease
 peninsular bighorn sheep (*Ovis canadensis cremnobates*) 561
 percolation theory 34, 45
Perognathus longimembris (pocket mouse) 564
Peromyscus leucopus (white-footed mouse) 482
Peromyscus maniculatus (deer mouse) 498
Petrogale lateralis (black-footed rock wallaby) 77–80
Petromyzon marinus (lamprey) 245–6, 454
 phantom midge larvae (*Chaoborus* spp.) 157
 phocine distemper in seals 484–90
Picoides borealis (red-cockaded woodpecker) 82, 83, 91
 piping plover (*Charadrius melodus*) 161
 plague (*Yersinia pestis*), extinction of black-tailed prairie dog colonies 482–3
 planktonic larvae see marine planktonic propagules (larvae or spores)
 pocket mouse (*Perognathus longimembris*) 564
 pollination of agricultural crops
 bee pollinators 256–8
 case study: coffee in Costa Rica 258–64, 275–80
 case study: kiwifruit in New Zealand 269–73, 275–80
 case study: watermelon in California 264–9, 275–80
 community-mediated service 258, 279–80
 counter-example: almond in California 273–4, 275–80
 counter-example: oil palm in Costa Rica 274–80
 diversity of pollinators 257–8
 economic connectivity 278–9
 ecosystem service 256–7
 effects of connectivity with native habitats 258–80
 factors affecting pollination services 277–9
 factors affecting pollinator activity 276–7
 habitat requirements of pollinators 256–7
 importance of native pollinators 258, 279–80
 population persistence, relationship of landscape connectivity 38–40
 population structures
 and gene flow patterns 75–86
 completely isolated islands 76, 77–82
 impact on reproductive fitness 85–6
 island structure (gene flow among equal-sized islands) 75, 85
 metapopulations 75, 76, 85–6
 partially connected fragments 82–5
 single large population 76, 85, 86
 source-sink (mainland-island) 75, 85
 stepping-stone models 75–6, 85
 potential connectivity 3
Proclissiana eunomia (butterfly) 56
 pronghorn antelope (*Antilocapra americana*) 594, 598, 599
Prunus dulcis (almond) 273–4, 275–80
Psammobates geometricus (geometric tortoise) 88–9
Pseudophryne corroborae (corroboree frog) 74
Pteropus spp. (flying foxes) zoonotic viral diseases 483
Pueraria montana var. *lobata* (kudzu) 452, 454

- Puma concolor* (mountain lion) 588–9, 590, 591, 601–2
- Puma concolor* (puma) 561, 563, 565, 573, 574
 - movement modeling case study: Southern California 356–65
- Puma concolor coryi* (Florida panther) 605
- purple loosestrife (*Lythrum salicaria*) 246
- Rangifer tarandus* (caribou) 601
- red-breasted goose (*Branta ruficollis*) 169
- red-cockaded woodpecker (*Picoides borealis*) 82, 83, 91
- reproductive fitness, impacts of population structures 85–6
- reserve network design
 - broad-scale planning 587–9
 - for metapopulation viability 587–9
- Rhinocyllus conicus* (weevil) 454
- rinderpest 484
- river ecosystems *see* hydrologic connectivity; land-water interface
- river otter (*Lontra canadensis*) 136
- roads
 - dispersal facilitation for some species 506
 - effects on wildlife 502–3
 - habitat changes caused by 504–5
 - habitat fragmentation effects 502–3, 504–6
 - impacts of reduced connectivity 505–6
 - means to restore habitat connectivity 503–4
 - mitigation of impacts on connectivity 507
 - mitigation passage planning 503
 - modeling animal movements (Trans-Canada Highway) 511–26
 - multi-taxonomic approach to mitigation evaluation 508
 - species-specific mitigation problems 507–8
 - transportation agencies' role in wildlife conservation 503, 526–8
 - wildlife attraction to 505
 - wildlife avoidance responses 505, 506
 - wildlife crossing function and performance 507–8
 - wildlife crossing performance measurement 508–11
 - wildlife crossing placement (Trans-Canada Highway) 511–26
 - wildlife crossing planning 503
 - wildlife numerical responses 505
- round goby (*Neogobius melanostomus*) 246
- royal catchfly (*Sabatia angularis*) 82
- Rutidosis leptorrhynchoides* (grassland daisy) 74, 82, 83
- Sabatia angularis* (royal catchfly) 82
- Salmo* spp. (trout) 326–31
- Salmo trutta* (brown trout) 331, 333
- salmon (*Oncorhynchus* spp.) 113, 119, 136, 137, 147
 - connectivity between populations 198
- salmonid fishes 244
 - advantages of genetic marker techniques 318–19
 - ecology and connectivity 319–22
 - factors affecting population persistence 320–2
 - habitat requirements 320
 - historical factors and connectivity 332–3
 - influence of landscape geometry 320–1
 - influences of natural and human-made movement barriers 328–31
 - influences of stream network structure 327–8
 - life history and connectivity 320–2, 331–2
 - metapopulation dynamics and connectivity 333–4
 - microsatellite marker case studies 326–31
 - migratory behavior 318, 319–22
 - repopulation mechanisms 320–1
 - resident populations 319–20
 - use of genetic techniques to assess connectivity 322–6
- Salvelinus* spp. (charrs) 326–31
- Salvelinus confluentus* (bull charr) 327, 330, 332
- Salvelinus fontinalis* (brook charr) 327–8, 332
- Salvelinus fontinalis* (brook trout) 243
- Salvelinus leucomaenis* (white-spotted charr) 330, 331
- Salvelinus namacush* (lake trout) 245–6
- San Joaquin kit fox (*Vulpes macrotis mutica*) 564
- scarlet gilia (*Ipomopsis aggregata*) 82
- sea turtle species, gene flow data from DNA markers 217

- sea turtles (connectivity research case study) 217–24
- age at sexual maturity 221
- coastal and nearshore habitat conservation 226–7
- connectivity-related conservation challenges 223–7
- early oceanic life stage 219–20
- embryonic development and hatching 219
- foraging in neritic habitats 221
- landscape connectivity 222
- migratory connectivity 222–4
- natal dispersal connectivity 222
- need for integration of research data 224
- nesting in coastal habitats 222
- perspectives on connectivity 217–18
- reproductive migration 221–2
- tagging programs 218
- techniques for measuring population connectivity 218
- types of connectivity shown 222–4
- types of life cycles 218–22
- Semicossyphus pulcher* (sheephead fish) 199
- Sequoia sempervirens* (California redwood) 91
- Setophaga ruticilla* (American redstart) 160, 172, 173–5
- sheephead fish (*Semicossyphus pulcher*) 199
- shrimps
- importance in river system 241–2
 - mortality due to hydrologic disturbances 241
- Silene tatarica* 89
- silver carp (*Hypophthalmichthys molitrix*) 246
- Sin Nombre virus 498
- small populations, genetic impacts 72–5
- Solenopsis invicta* (fire ant) 452
- Sonoran Desert fishes 303–4
- South Coast Ecoregion (California)
- linkages between large wildland areas 555–6
 - threatened species 555
- South Coast Missing Linkages project 556–7
- approach to linkage planning 557–83
- spatial ecology 44
- spatially explicit population models (SEPMs)
- classifying landscapes by patch-matrix contrast 374–7
 - compared with simpler landscape indices and models 383–5
 - conservation planning role 385–6
 - conservation resource allocation tool 371
 - corridor planning and patterns of dispersal 380–3
 - corridor planning in medium-contrast landscapes 377–80
 - definitions 371–4
 - evaluation of connectivity and viability for large carnivores 370–1, 374–83
 - evaluation of functional connectivity 369–70
 - PATCH model 372–4, 375–80, 381
 - types of models 371–4
 - use in corridor identification and design 605–6
- speciation effects, connectivity research 26
- species-specific connectivity 32–5, 36
- St. Francis satyr butterfly (*Neonympha mitchellii francisci*) 400–2
- starling (*Sturnus vulgaris*) 454
- statistical models of animal movement 346–56
- animal movement data 347–9
 - case study: carnivore movement in Southern California 356–65
 - decision tree models 351–2
 - finite mixture models 351–2
 - general approach 346–7
 - individual-based movement simulations 352–6
 - non-linear regression model 350–1
- steelhead (*Oncorhynchus mykiss*) 333, 565
- Stephanomeria malheurensis* (Malheur wirelettuce) 91
- stepping stones 12, 33, 75–6, 85, 607–8
- Sterna paradisaea* (Arctic tern) 157
- stochastic patch occupancy models (SPOMs) 59–62, 62–4, 65
- striped bass (*Morone saxatilis*) 245
- Strix occidentalis caurina* (northern spotted owl) 373
- structural (or physical) connectivity 3
- measurement 30–2
 - research 24, 25
 - theory misapplication in land management 30, 31–2, 35–6, 38
- Sturnus vulgaris* (starling) 454
- Swainson's hawk (*Buteo swainsoni*) 161

- Swainson's thrush (*Catharus ustulatus*) 169
- Sylvilagus palustris hefneri* (Lower Keys marsh rabbit) 594
- Syncerus caffer* (buffalo) 89
- tamarisk (*Tamarix ramoissima*) 573
- Taxidea taxus* (badger) 565
- Taxus brevifolia* (Pacific yew) 87–8
- Tribolium* (flour beetles) 84
- trout (*Oncorhynchus* spp., *Salmo* spp.) 326–31
- Tryngites subruficollis* (buff-breasted sandpiper) 161
- tule elk (*Cervus elaphus nannodes*) 83
- Tympanuchus cupido pinnatus* (greater prairie chicken) 82, 84
- Typha* spp. (cattail) 246
- Urocyon cinereoargenteus* (gray fox) 548
- Ursus americanus* (black bear) 136, 148, 597, 598–9, 601
- Ursus americanus floridanus* (Florida black bear) 605
- Ursus americanus kermodei* (Kermode black bear) 135–6
- Ursus americanus luteolus* (Louisiana black bear) 601
- Ursus arctos* (brown bear) 91, 113
- Ursus arctos* (grizzly bear) 135, 148, 244, 418, 595, 601, 603
 - population connectivity and viability models 370–1, 374–80
- Varanus indicus* (monitor lizard) 454, 456
- variegated fritillary (*Euptoieta claudia*) 404–5
- Vipera berus* (adder) 82
- virtual migration model 53–5, 56
- Vulpes macrotis mutica* (San Joaquin kit fox) 564
- Vulpes vulpes* (fox) 652
- water *see* hydrologic connectivity; land-water interface linkages
- water fleas (*Daphnia*) 84
- watermelon (*Citrullus lanatus*) 264–9, 275–80
- weevil (*Elaeiodobius kamerunicus*) 274–5
- weevil (*Rhinocyllus conicus*) 454
- western pond turtle (*Clemmys marmorata*) 565
- western toad (*Bufo boreas*) 565
- western willet (*Catoptrophorus semipalmatus*) 161–2
- white-footed mouse (*Peromyscus leucopus*) 482
- white sea bream (*Diplodus sargus*) 498
- white-spotted charr (*Salvelinus leucomaenis*) 330, 331
- whooping crane (*Grus americana*) 608
- wolf (*Canis lupus*) 84, 113, 603 *see also* gray wolf
- wolverine (*Gulo gulo*) 603
- The Woodland Trust, land management strategy 35–6
- Wright's F_{ST} 86–90, 323–4
- Yersinia pestis* (plague), extinction of black-tailed prairie dog colonies 482–3
- Zalophus wollebaecki* (Galapagos sea lion) 115
- zebra mussel (*Dreissena polymorpha*) 246, 452, 458, 464
- zoonotic viral diseases 481–2
 - in flying foxes 483