

## **Richard T. T. Forman**

Research Professor, Harvard University, Graduate School of Design, 48 Quincy Street, Cambridge, MA 02138, USA

### **Early Career**

Professor Forman received his bachelor's degree in biology at Haverford College and Ph.D. in botany at the University of Pennsylvania, after which he served two years as an American Friends Service Committee volunteer in Guatemala and Honduras. His scholarly roots are in plant, avian and forest ecology. An early (1962) experimental study, using a "micro-phytotron" constructed in the lab (pre-growth-chamber era) explained the hierarchical distributions of a plant species at ten spatial scales, just before ecology's focus on spatial scale a decade later. Other early research subjects included moss ecology, tropical rainforest, and community structure. In an era before ecologists focused on heavy-human-imprint areas and spatial pattern, he and colleagues used old-growth woods in farmland for the first (1976) statistically designed test highlighting the effect of patch size on biodiversity, a subject explored in thousands of subsequent studies. Immediately thereafter he spearheaded a then rare multidimensional analysis and 1979 book for an entire landscape, *Pine Barrens: Ecosystem and Landscape*, including its patch-corridor pattern.

### **Landscape Ecology**

These last two steps galvanized the idea of landscape ecology, and with colleagues from several fields, Forman began to build the foundations for a field of study. The ecological corridor concept, now widely used, was described (1981, 1983). A coauthored landscape-wide modeling study (1987) emerged as a key for solving the subsequent logging-and-owls controversy in the USA Pacific Northwest. His coauthored 1986 book, *Landscape Ecology*, was the first synthesis of modern landscape ecology, and elaborated the patch-corridor-matrix model for understanding and improving land use pattern, now a standard conceptual foundation. In 1995 a more definitive book, *Land Mosaics: The Ecology of Landscapes and Regions*, extended the vision to include regions, and catalyzed landscape ecology's widespread growth. A small widely used coauthored 1996 book, *Landscape Ecology Principles for Landscape Architecture and Land-Use Planning*, highlighted applications for society. Later he used landscape ecology to understand coastal and urban regions.

### **Road Ecology**

In 1995, challenged by the paradox of conspicuous road systems in the landscape and hardly any ecological understanding of them, Dr. Forman began collaborating with the transportation community and wildlife biologists to build a field of road ecology. His articles with colleagues provided early syntheses and ideas, which led to spearheading a 2003 volume, *Road Ecology: Science and Solutions*, co-authored by 14 leading ecologists, hydrologist, and transportation experts. As the first comprehensive book on the ecology of roads and vehicles, the book effectively jump-started the field's coalescence. Both basic

research and implementation of mitigation/design solutions in transportation have noticeably expanded worldwide.

Looking ahead with a transportation leader, Forman outlined (2011) a netway system, replacing roads and cars, to recover and reconnect the land for nature and us (a solution that also improves safe and efficient mobility, uses renewable energy and no fossil fuel, emits no unhealthful pollutants or greenhouse gas, and enhances market gardening and recreational trail networks near cities/towns).

## **Urban Ecology**

Forman's interest in urban ecology coalesced in a planning project and 2004 book, *Mosaico territorial para la region metropolitana de Barcelona* (later selected as one of the top "Design with Nature Now" projects by the University of Pennsylvania's Ian McHarg Center), highlighting natural systems and their uses, plus some novel solutions, for the Barcelona Region (Spain). Further dimensions evolved in local ecological and planning analyses for a suburban town near Boston, and in global-scale studies. These foundations led to a big-picture spatial environmental analysis of 38 large-to-small urban regions (*Urban Regions: Ecology and Planning Beyond the City*, 2008). Then, burrowing into cities worldwide, in 2014 he produced a relatively comprehensive state-of-the-science synthesis, *Urban Ecology: Science of Cities* (a finalist for the Society of Biology Award, London), tying together organisms, built structures, and the physical environment where people are concentrated.

More-recent coauthored papers (2016) open the frontier of best places for the next billion people at global and urban-region scales, and highlight the key role of urban region plans.

## **Town Ecology and Current Work**

Forman explores town ecology internationally, highlighting interactions between towns and villages and surrounding agricultural and natural lands. The land of towns (e.g. population 2000 to 30 000) and villages, covering perhaps half the global land and containing nearly half the human population, provides most terrestrial resources for society.

Focusing on the development of ecological principles and their use for society is also of current interest. He is associated with and active in Harvard's Graduate School of Design, FAS Environmental Science and Public Policy undergraduate concentration, the Harvard University Center for the Environment, and The Harvard Forest.

## **International Honors**

Professor Forman served as a Fulbright Scholar in Colombia, CNRS Chercheur in France, Miegunyah Fellow at the University of Melbourne, CRES Fellow at Australian National University, and Founding Vice President of the International Association for Landscape Ecology. He received medals from the Faculty of Science of Charles University (Prague) and the Faculty of Architecture of the University of Florence (Italy). He served as Consultant to the President and Minister of Natural Resources of Costa Rica, the Mayor and Chief Architect/Planner of Barcelona, and the Chinese Academy of Transportation Sciences,

Ministry of Transport. He is a Member of Clare Hall (University of Cambridge), an Honorary Member of the Italian Society of Landscape Ecology, and in China an Honorary Professor at Inner Mongolia University and the Academia Sinica Institute of Applied Ecology.

### **Honors in the USA**

Dr. Forman has received honorary degrees from Miami University (Doctor of Humane Letters), Harvard University (Master of Arts), Conway School of Design, and Florida International University (Doctor of Science). He served as Vice President of the Ecological Society of America and President of the Torrey Botanical Society. He established the Ecological Society of America's first Washington Office, overseeing its initial policy and practices. In addition to directing university graduate programs, for twelve years he directed a small ecological research center at Rutgers, the Hutcheson Memorial Forest Center. Forman has been a Member of the Editorial Board of six scientific journals, and has served on three National Research Council/TRB committees. He has written Forewords for 16 published books. His board memberships included The Trustees of Reservations and The Nature Conservancy-Massachusetts Chapter. He was named Distinguished Landscape Ecologist by IALE, received the Pine Barrens Hall of Fame Award, is an inaugural Fellow of the Ecological Society of America, and was elected Fellow of the American Association for the Advancement of Science.

### **Other Experience**

Biological Aide, U. S. Fish and Wildlife Service, Patuxent Research Refuge, Maryland. Member, Committee of Examiners for GRE Advanced Test in Biology, Educational Testing Service. Consultant and collaborator with The Nature Conservancy in protection of natural areas. Presenter of four workshops/sessions on landscape ecology and its applications, Florence, Italy. Invited presentations (>250) at institutions in Norway, Sweden, United Kingdom, Ireland, Belgium, Netherlands, Germany, Switzerland, Czech Republic, Slovakia, Romania, Turkey, Italy, France, Spain, Portugal, Canada, USA, Mexico, Guatemala, Costa Rica, Colombia, Venezuela, Brazil, Chile, Australia, New Zealand, Japan, China. Numerous invited talks at Forman's home university and papers presented at professional meetings. Commencement address, "Choose a place, at any scale; make it better, for nature and us," Florida International University. Four plans and reports for a local Massachusetts town. Service on diverse task forces, committees and boards for local and state agencies plus statewide non-profit organizations, focusing on land-use planning, open space protection, conservation, recreation, and historic preservation.

### **Teaching**

Professor Forman taught at the Escuela Agricola Panamericana (Honduras), University of Wisconsin, Rutgers University, and several field stations. At Harvard, he was the PAES Professor of Landscape Ecology, teaching graduate ecology courses for the Graduate School of Design's Landscape Architecture Department and a junior-senior ecology and land-use planning course in the Faculty of Arts and Sciences. Courses often included 2-to-7-day

intensive field-study trips in areas from Maine to New Mexico, Florida, the Caribbean, and Venezuela. He served as advisor for 11 doctoral students and 21 masters and senior-thesis students. Forman was a finalist for the Levenson Outstanding Teacher Award in Harvard College three times, was voted Harvard College Class of 2011 Favorite Professor, and received the Lindback Foundation Award for Excellence in Teaching. He relishes teaching and student learning, often highlighting ways to use the principles for improving the land around us. Currently he teaches Harvard's graduate Urban and Town Ecology course.

### **Primary Books**

- Forman, R. T. T., ed. 1979. *Pine Barrens: Ecosystem and Landscape*. Academic Press, New York. 601 pp. [1998 edition, Rutgers University Press].
- Forman, R. T. T. and M. Godron. 1986. *Landscape Ecology*. John Wiley, New York. 619 pp. [1990, 1994 Chinese editions; 1993 Czech edition].
- Zonneveld, I. S. and R. T. T. Forman, eds. 1990. *Changing Landscapes: An Ecological Perspective*. Springer-Verlag, New York. 286 pp.
- Forman, R. T. T. 1995. *Land Mosaics: The Ecology of Landscapes and Regions*. Cambridge University Press, Cambridge/New York. 632 pp. [2000 Korean edition (2002 paperback)].
- Dramstad, W., J. D. Olson, and R. T. T. Forman. 1996. *Landscape Ecology Principles in Landscape Architecture and Land-Use Planning*. Published by Harvard University Graduate School of Design, American Society of Landscape Architects, and Island Press, Washington, D.C. 80 pp. [2005 Spanish edition; 2006 Chinese edition; 2008 Farsi edition].
- Forman, R. T. T., D. Sperling, J. A. Bissonette, A. P. Clevenger, C. D. Cutshall, V. H. Dale, L. Fahrig, R. France, C. R. Goldman, K. Heanue, J. A. Jones, F. J. Swanson, T. Turrentine, and T. C. Winter. 2003. *Road Ecology: Science and Solutions*. Island Press, Washington, D. C. 481 pp. [2008 Chinese edition].
- Forman, R. T. T. 2004. *Mosaico territorial para la region metropolitana de Barcelona. (Land Mosaic for the Greater Barcelona Region)*. Editorial Gustavo Gili, Barcelona, Spain. 150 pp.
- Forman, R. T. T. 2008. *Urban Regions: Ecology and Planning Beyond the City*. Cambridge University Press, Cambridge/New York. 408 pp.
- Forman, R. T. T. 2014. *Urban Ecology: Science of Cities*. Cambridge University Press, Cambridge/New York. 462 pp. [Chinese edition 2018].
- Forman, R. T. T. 2018. *Towns, Ecology, and the Land*. Cambridge University Press, Cambridge/New York. In press.

### **Selected Scholarly Articles**

- Forman, R. T. T. 1964. Growth under controlled conditions to explain the hierarchical distributions of a moss, *Tetraphis pellucida*. *Ecological Monographs* 34: 1-25.
- Forman, R. T. T. 1975. Canopy lichens with blue-green algae: a nitrogen source in a Colombian rainforest. *Ecology* 56: 1176-1184.
- Forman, R. T. T., A. E. Galli, and C. F. Leck. 1976. Forest size and avian diversity in New Jersey woodlots with some land-use implications. *Oecologia* 26: 1-8.

- Allen, E. B. and R. T. T. Forman. 1976. Plant species removals and old-field community structure and stability. *Ecology* 57: 1233-1243.
- Forman, R. T. T. 1979. The Pine Barrens of New Jersey: an ecological mosaic. In *Pine Barrens: Ecosystem and Landscape*, R. T. T. Forman, ed. Academic Press, New York. Pp. 569-585.
- Forman, R. T. T. and M. Godron. 1981. Patches and structural components for a landscape ecology. *BioScience* 31: 733-740.
- Forman, R. T. T. and R. E. J. Boerner. 1981. Fire frequency and the Pine Barrens of New Jersey. *Bulletin of the Torrey Botanical Club* 108: 34-50.
- Risser, P. G., J. R. Karr, and R. T. T. Forman. 1983. *Landscape Ecology: Directions and Approaches*. Illinois Natural History Survey, Special Publication Number 2, Champaign, Illinois. 18 pp.
- Forman, R. T. T. 1983. Corridors in a landscape: their ecological structure and function. *Ekologia (Czechoslovakia CSSR)* 2: 375-387.
- Forman, R. T. T. and J. Baudry. 1984. Hedgerows and hedgerow networks in landscape ecology. *Environmental Management* 8: 495-510.
- Milne, B. T. and R. T. T. Forman. 1986. Peninsulas in Maine: woody plant diversity, distance, and environmental patterns. *Ecology* 67: 967-974.
- Franklin, J. F. and R. T. T. Forman. 1987. Creating landscape patterns by forest cutting: ecological consequences and principles. *Landscape Ecology* 1: 5-18.
- Hardt, R. A. and R. T. T. Forman. 1989. Boundary form effects on woody colonization of reclaimed surface mines. *Ecology* 70: 1252-1260.
- Peterken, G. F., D. Ausherman, M. Buchenau, and R. T. T. Forman. 1992. Old-growth conservation within British upland conifer plantations. *Forestry* 65: 127-144.
- Cantwell, M. D. and R. T. T. Forman. 1994. Landscape graphs: ecological modeling with graph theory to detect configurations common to diverse landscapes. *Landscape Ecology* 8: 239-255.
- Forman, R. T. T. and S. K. Collinge. 1995. The "spatial solution" to conserving biodiversity in landscapes and regions. In *Conservation of Faunal Diversity in Forested Landscapes*. R. M. DeGraaf and R. I. Miller, eds. Chapman & Hall, London. Pp. 537-568.
- Forman, R. T. T. and A. M. Hersperger. 1996. Road ecology and road density in different landscapes, with international planning and mitigation solutions. In *Trends in Addressing Transportation Related Wildlife Mortality*. G. L. Evink et al., eds. Publication FL-ER-58-96, Florida Department of Transportation, Tallahassee, Florida. Pp. 1-22.
- Forman, R. T. T. and L. E. Alexander. 1998. Roads and their major ecological effects. *Annual Review of Ecology and Systematics* 29: 207-231.
- Collinge, S. K. and R. T. T. Forman. 1998. A conceptual model of land conversion processes: predictions and evidence from a microlandscape experiment with grassland insects. *Oikos* 82: 66-84.
- Forman, R. T. T. 2000. Estimate of the area affected ecologically by the road system in the United States. *Conservation Biology* 14: 31-35.
- Forman, R. T. T. and R. D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (USA) suburban highway. *Conservation Biology* 14: 36-46.
- Forman, R. T. T., B. Reineking, and A. M. Hersperger. 2002. Road traffic and nearby grassland bird patterns in a suburbanizing landscape. *Environmental Management* 29: 782-800.

- Hersperger, A. M. and R. T. T. Forman. 2003. Adjacency arrangement effects on plant diversity and composition in woodland patches. *Oikos* 101: 279-290.
- Forman, R. T. T. 2004. Road ecology's promise: What's around the bend? *Environment* 46: 8-21.
- Forman, R. T. T., P. L. Reeve, H. Beyer, J. Bolduc, J. Ferguson, R. Johnson, A. Lukens, A. Proulx, P. Siebert, B. Stokey, M. Thornton, and K. Edwards. 2004. *Open Space and Recreation Plan 2004: Concord, Massachusetts*. Natural Resources Commission, Concord, Massachusetts. 206 pp.
- Forman, R. T. T. 2008. The urban region: natural systems in our place, our nourishment, our home range, our future. *Landscape Ecology* 23: 251-253.
- McDonald, R. I., P. Kareiva, and R. T. T. Forman. 2008. The implications of current and future urbanization for global protected areas and biodiversity conservation. *Biological Conservation* 141: 1695-1703.
- McDonald, R. I., R. T. T. Forman, P. Kareiva, R. Neugarten, D. Salzer, and J. Fisher. 2009. Urban effects, distance, and protected areas in an urbanizing world. *Landscape and Urban Planning* 93: 63-75.
- Forman, R. T. T. 2010. Coastal regions: spatial patterns, flows, and a people-nature solution from the lens of landscape ecology. In *La costa obliqua: Un atlante per la Puglia (The Oblique Coast: An Atlas for Puglia)*. M. Mininni, ed. Donzelli editore, Roma, Italy. Pp. 249-265.
- Hurley, S. E. and R. T. T. Forman. 2011. Stormwater ponds and biofilters for large urban sites: modeled arrangements that achieve the phosphorus reduction target for Boston's Charles River, USA. *Ecological Engineering* 37: 850-863.
- Forman, R. T. T. and D. Sperling. 2011. The future of roads: no driving, no emissions, nature reconnected. *Solutions* 2: 10-23. (Expanded version, [www.thesolutionsjournal.com](http://www.thesolutionsjournal.com)).
- Forman, R. T. T. 2012. Infrastructure and nature: reciprocal effects and patterns for our future. In *Infrastructure Sustainability and Design*. S. N. Pollalis, D. L. Schodek, S. J. Ramos, and A. Georgoulas, eds. Routledge, New York. Pp. 35-49.
- Lydecker, M. and R. T. T. Forman. 2013. Diverse productive roadsides: ecologically integrating agriculture along our highways. *Oecologia Australis* 17: 157-174.
- Forman, R. T. T. 2014. The Barcelona edge: combining built and natural environments. In *Urbanism of open spaces: landscape, leisure and production*. Barcelona, Spain: Quaderns--Pla Director Urbanistic 03, Workshop 2, Area Metropolitana de Barcelona. Pp. 26-40.
- Forman, R. T. T. 2015. Corredores verdes ecologicos--Ecological green corridors. *Paisea* 30: 8-13.
- Forman, R. T. T. 2015. Launching landscape ecology in America and learning from Europe. In *History of Landscape Ecology in the United States*. G. W. Barrett, T. L. Barrett and J. Wu, eds. New York: Springer. Pages 13-30.
- Kolbe, J. J., VanMiddlesworth, P., Battles, A. C., Stroud, J. T., Buffum, B., Forman, R. T. T. and Losos, J. B. 2016. Determinants of spread in an urban landscape by an introduced lizard. *Landscape Ecology* DOI: 10.1007/s10980-016-0362-1. 19 pages.
- Forman, R. T. T. and Wu, J. 2016. Where are the best places for the next billion people? Think globally, plan regionally. In *Handbook on Biodiversity and Ecosystem Services in Impact Assessment*, D. Geneletti, ed. Cheltenham, UK: Edward Elgar Publishers. Pp. 453-473.

Forman, R. T. T. 2016. Urban ecology principles: Are urban ecology and natural area ecology really different? *Landscape Ecology* 31: 1653-1662.

Forman, R. T. T. and Wu, J. 2016. Where to put the next billion people. *Nature* 537: 408-411.