

STEVEN F. RAILSBACK
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DEGREES:

University of Bergen (Norway), Ph.D., Biology, 2004
University of Illinois, M.S., Environmental Engineering, 1981
University of Illinois, B.S., Civil Engineering, 1979

PROFESSIONAL HISTORY:

2002-present Humboldt State University, Adjunct Professor, Department of Mathematics
1992-present Lang, Railsback & Assoc., Consulting Research Scientist
1986-1992 Environmental Sciences Division, Oak Ridge National Laboratory,
Research Associate
1985 Entrix, Inc., Staff Scientist
1984 U.S. Army, Fort Richardson, Alaska, Environmental Branch Chief
1982-1984 U.S. Army, Fort Richardson, Alaska, Environmental Engineer
1981-1982 U.S. Army, Construction Engineering Research Laboratory,
Environmental Engineer

HONORS AND PROFESSIONAL ACTIVITIES:

Registered Civil Engineer, California license no. C 041059
Graduation with highest honors, University of Illinois
Member: American Fisheries Society, Ecological Society of America
Member and past president, Board of Directors, Swarm Development Group (a non-profit corporation supporting agent-based simulation in the study of complex systems)
Invited presentations on modeling ecological complexity: University of California at Santa Cruz, Environmental Research Center Leipzig-Halle (Germany), Los Alamos National Laboratory Center for Nonlinear Studies, Santa Fe Institute, Simon Fraser University, University of Michigan Center for the Study of Complex Systems, 5th International Conference on Ecological Informatics, Computational Social Science Society of the Americas, Fisheries Society of the British Isles
Reviewer for *Adaptive Behavior*, *The American Naturalist*, *Biological Reviews*, *Canadian Journal of Fisheries and Aquatic Sciences*, *Ecological Applications*, *Ecological Modelling*, *Ecology*, *Ecology Letters*, *Environmental Biology of Fishes*, *Environmental Management*, *Environmental Science and Technology*, *Games and Economic Behavior*, *Hydrobiologia*, *Journal of Applied Ecology*, *Journal of Fish Biology*, *Journal of Statistical Software*, *Journal of Theoretical Biology*, *North American Journal of Fisheries Management*, *Preventive Veterinary Medicine*, *Proceedings of the National Academy of Sciences*, *Reviews in Fisheries Science*, *Transactions of the American Fisheries Society*

EXPERIENCE:

Steven F. Railsback is an environmental engineer with strong interests in the analysis of environmental impacts to aquatic life and simulation of ecological systems. His experience includes studies of both water quality and water quantity impacts of resource development, and work in a number of other fields of environmental management.

As a partner in Lang, Railsback & Assoc., Dr. Railsback works on research and assessment for environmental effects of water development in California and the west. The current focus of this work is development of individual-based models as tools for assessing the cumulative effects of stream alteration on fish communities. He is developing both software and theoretical approaches to individual-based modeling, and has applied individual-based salmonid models to research and management issues at sites including small coastal streams, the Sacramento River basin, and the Green River below Flaming Gorge Reservoir, Utah.

Between 1992 and 2000, he managed and conducted research on environmental effects of hydropower projects for major California utilities. His research management experience included selection of high-priority research topics, development of study plans, and managing studies. This program focused on instream flow and water temperature management. He participated in modeling studies of temperatures released from Sierra Nevada reservoirs and a follow-up study of impacts on salmon fisheries of an Alaskan hydroelectric project.

At Oak Ridge National Lab, Dr. Railsback was mainly involved in analysis of the impacts of hydroelectric developments on stream fisheries. He performed instream flow and water quality assessments for proposed hydroelectric projects in California and the Pacific Northwest, and developed a water quality model to evaluate cumulative effects of hydropower development at navigation dams in the upper Ohio River basin. For the Ohio River basin study he developed techniques for modeling aeration at navigation dams and included the dam aeration models in a basin-wide dissolved oxygen model. He also participated in Department of Energy research on instream flow, dissolved oxygen, and fish passage mitigation. Dr. Railsback conducted a modeling study of climate change effects on reservoir fish habitat.

As an environmental engineer for the U.S. Army, he was responsible for the development and implementation of procedures to keep Army facilities in Alaska in compliance with environmental regulations.

Dr. Railsback's MS research at the University of Illinois involved the application of hydrologic and hydraulic principles to biological impact assessment for streams. His work included development of habitat models for aquatic insects; development of low-flow impact assessment methods for midwestern streams; and assessments of fish and aquatic insect populations.

PUBLICATIONS:

- Railsback, S. F., B. C. Harvey, S. J. Kupferberg, M. M. Lang, S. McBain, and H. H. Welsh, Jr. Modeling potential river management conflicts between frogs and salmonids. *Canadian Journal of Fisheries and Aquatic Sciences*, in press.
- Railsback, S. F., B. C. Harvey, and J. L. White. Effects of spatial extent on modeled relations between habitat and salmon spawning success. *Transactions of the American Fisheries Society*, in press.
- Ayllón, D., S. F. Railsback, S. Vincenzi, J. Groeneveld, A. Almodóvar, and V. Grimm. InSTREAM-Gen: modelling eco-evolutionary dynamics of trout populations under anthropogenic environmental change. *Ecological Modelling*, in press.
- Belarde, T. A., and S. F. Railsback. New predictions from old theory: emergent effects of multiple stressors in a model of piscivorous fish. *Ecological Modelling*, in press.
- Rosenberger, A. E., J. B. Dunham, J. R. Neuswanger, and S. F. Railsback. Legacy effects of wildfire on stream thermal regimes and rainbow trout ecology: an integrated analysis of observation and individual-based models. *Freshwater Science*, in press.
- Penaluna, B. E., S. F. Railsback, J. B. Dunham, S. Johnson, R. E. Bilby, and A. E. Skaugset. The role of the geophysical template and environmental regimes in controlling stream-living trout populations. *Canadian Journal of Fisheries and Aquatic Sciences*, in press.
- Stillman, R. A., S. F. Railsback, J. Giske, U. Berger, and V. Grimm. Making predictions in a changing world: the benefits of individual-based ecology. *BioScience* 65: 140-150, 2015.
- Railsback, S.F., and Johnson, M.D. Effects of land use on bird populations and pest control services on coffee farms. *Proceedings of the National Academy of Sciences of the United States of America* 111:6109-6114, 2014.
- Railsback, S. F., B. C. Harvey, and J. L. White. Facultative anadromy in salmonids: linking habitat, individual life history decisions, and population-level consequences. *Canadian Journal of Fisheries and Aquatic Sciences* 71:1270-1278, 2014.
- Grimm, V., J. Augusiak, A. Focks, B. M. Frank, F. Gabsi, A. S. A. Johnstong, C. Liu, B. T. Martin, M. Meli, V. Radchuk, P. Thorbek, and S. F. Railsback. Towards better modelling and decision support: documenting model development, testing, and analysis using TRACE. *Ecological Modelling* 280:129-139, 2014.
- Railsback, S. F. and B. C. Harvey. Trait-mediated trophic interactions: is foraging theory keeping up? *Trends in Ecology & Evolution* 28:119-125, 2013.
- Railsback, S. F., M. Gard, B. C. Harvey, J. L. White, and J. K. H. Zimmerman. Contrast of degraded and restored stream habitat using an individual-based salmon model. *North American Journal of Fisheries Management* 33:384-399, 2013.
- Railsback, S. F. and V. Grimm. Individual-based ecology. Pages 365-371 in A. Hastings and L. Gross, editors. *Encyclopedia of Theoretical Ecology*. University of California Press, 2012.
- Railsback, S. F., and V. Grimm. *Agent-based and individual-based modeling: A practical introduction* (textbook). Princeton University Press, Princeton, New Jersey, 2012.
- Grimm, V., and S. F. Railsback. Pattern-oriented modelling: a 'multiscope' for predictive systems ecology. *Philosophical Transactions of the Royal Society B* 367:298-310, 2012.
- Grimm, V., and S. F. Railsback. Designing, formulating, and communicating agent-based models. Pages 361-378 in A. J. Heppenstall, A. T. Crooks, L. M. See, and B. Michae, editors. *Agent-based models of geographical systems*. Springer, New York, 2012.

- Harvey, B. C. and S. F. Railsback. Effects of passage barriers on demographics and stability properties of a virtual trout population. *River Research and Applications* 28:479-489, 2012.
- Railsback, S. F., and B. C. Harvey. Importance of fish behaviour in modelling conservation problems: food limitation as an example. *Journal of Fish Biology* 79:1648-1662, 2011.
- Railsback, S. F., and M. D. Johnson. Pattern-oriented modeling of bird foraging and pest control in coffee farms. *Ecological Modelling* 222:3305-3319, 2011.
- Grimm, V., and S. F. Railsback. Model the real, artificial, or stylized iguana? Artificial life and adaptive behavior can be linked through pattern-oriented modeling. *Adaptive Behavior* 17:309-312, 2009.
- Harvey, B. C., and S. F. Railsback. Exploring the persistence of stream-dwelling trout populations under alternative real-world turbidity regimes with an individual-based model. *Transactions of the American Fisheries Society* 138:348-360, 2009.
- Railsback, S. F., and C. Chamberlin. Low energy homebrewing. *Zymurgy* 32(2): 24-31, 2009.
- Railsback, S. F., and J. Kadvany. Demonstration flow assessment: judgment and visual observation in instream flow studies. *Fisheries* 33: 217-227, 2008.
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- Grimm, V. and S. F. Railsback. Agent-Based Models in Ecology: Patterns and Alternative Theories of Adaptive Behaviour. In: Billari, F., T. Fent, A. Prskawetz, and J. Scheffran (eds.), *Agent-based Computational Modelling: Applications in Demography, Social, Economic and Environmental Sciences*. Physica Verlag, Heidelberg, 2006.
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