

# CV Nele Schuwirth

PD Dr. Nele Schuwirth  
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Department Systems Analysis, Integrated Assessment and Modelling  
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## Research Interests

- Mechanistic modelling of biogeochemical and ecological processes in river ecosystems facing multiple stressors by integration of ecological theory and empirical knowledge; Use of these models for improving the mechanistic understanding of processes in these systems and for the prediction of expected effects resulting from management actions and changing external influence factors (e.g. land use, climate change); Quantification of model uncertainty and parameter inference applying Bayesian statistics.
- Multi-criteria decision support methods for surface water management and assessment using multi attribute value and utility theory as an interface between science and practice; Elicitation of preferences in complex environmental decision situations, aggregation of values, addressing uncertainty; Development of ecological assessment methods in collaboration with practitioners from biomonitoring and surface water management.

## Education and Degrees

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| 2019 | Venia Legendi (Habilitation) at the Swiss Federal Institute of Technology (ETH) Zurich, Switzerland, Department of Environmental Systems Science (D-USYS) in Ecological Modelling    |
| 2006 | Dr. rer. nat. (Ph.D.), Department of Geosciences, Johannes Gutenberg-University Mainz, Germany, Thesis: „The release of zinc and lead from mine tailings” ( <i>summa cum laude</i> ) |
| 2002 | Diploma (M.Sc.) in Geology, Johannes Gutenberg-University Mainz, Germany   |

## Professional experience

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| since 2021 | Head of the department Systems Analysis, Integrated Assessment and Modelling at Eawag, Dübendorf, Switzerland  |
| since 2015 | Lecturer at the Swiss Federal Institute of Technology (ETH) Zurich, Switzerland, Department of Environmental Systems Science (D-USYS)  |
| since 2012 | Group leader of the working group Ecological Modelling (tenured since 2014), Department Systems Analysis, Integrated Assessment and Modelling, Eawag, Dübendorf, Switzerland   |
| 2010-2012  | Scientist in the project "Integrated River Water Quality Management" in the NRP61 research program of the Swiss National Science Foundation, Department Systems Analysis, Integrated Assessment and Modelling, Eawag, Dübendorf, Switzerland |
| 2006-2010  | Postdoctoral research fellow, Department Systems Analysis, Integrated Assessment and Modelling, Eawag, Dübendorf, Switzerland, projects on ecosystem modeling and decision support   |
| 2002-2005  | Research assistant and PhD student, Institute of Geosciences, Research Group Hydrogeology, Johannes-Gutenberg University Mainz, Germany  |

## Scientific Publications

### submitted or in press

Carles, L., Wullschleger, S., Joss, A., Eggen, R.I.L., Schirmer, K., **Schuwirth**, N., Stamm, Ch., Tlili, A.: Impact of wastewater on the microbial diversity of periphyton and its tolerance to micropollutants in an engineered flow-through channel system. *Water Research* (accepted)

Caradima, B., Scheidegger, A., Brodersen, J., **Schuwirth**, N.: Bridging mechanistic conceptual models and statistical species distribution models of riverine fish. *Ecological Modelling* (accepted)

### published

35. Vermeiren, P., Reichert, P., Graf, W., Leitner, P., Schmidt-Kloiber, A., **Schuwirth**, N. (2021): Confronting prior knowledge on ecological preferences of stream invertebrates with independent monitoring data using a Bayesian multi-species distribution model. *Freshwater Science*, 40, 202-220. doi:10.1086/713175

34. **Schuwirth**, N. (2020): Towards an integrated surface water quality assessment: Aggregation over multiple pollutants and time. *Water Research*, 186, 116330. doi:10.1016/j.watres.2020.116330 (open access)

33. Caradima B., Reichert P. & **Schuwirth** N. (2020) Effects of site selection and taxonomic resolution on the inference of stream invertebrate responses to environmental conditions. *Freshwater Science*, 39, 415-432. doi:10.1086/709024

32. Vermeiren, P., Reichert, P., **Schuwirth**, N. (2020): Integrating uncertain prior knowledge regarding ecological preferences into multi-species distribution models: effects of model complexity on predictive performance. *Ecological Modelling*, 420, 108956. doi:10.1016/j.ecolmodel.2020.108956 (open access)

31. **Schuwirth**, N., Domisch, S., Friedrichs, M., Kattwinkel, M., Kneis, D., Kuemmerlen, M., Langhans, S., Martinez-Lopez, J., Borgwardt, F., Vermeiren, P. (2019): How to make ecological models useful for environmental management. *Ecological Modelling* 411, 108784. doi:10.1016/j.ecolmodel.2019.108784 (open access)

30. Caradima, B., **Schuwirth**, N., Reichert, P. (2019): From individual to joint species distribution models: a comparison of model complexity and predictive performance. *Journal of Biogeography* 46(10), 2260-2274. doi:10.1111/jbi.13668

29. Kuemmerlen, M., Reichert, P., Siber, R., **Schuwirth**, N. (2019): Ecological assessment of river networks: from reach to catchment scale. *Science of the Total Environment* 650, 1613-1627. doi:10.1016/j.scitotenv.2018.09.019 (open access)

28. Haag, F., Lienert, J., **Schuwirth**, N., Reichert, P. (2019): Identifying non-additive multi-attribute value functions based on uncertain indifference statements. *Omega* 85, 49-67. doi:10.1016/j.omega.2018.05.011 (open access)

27. **Schuwirth**, N., Honti, M., Logar, I., Stamm, Ch. (2018): Multi-criteria decision analysis for integrated water quality assessment and management support. *Water Research X* 1, 100010. doi:10.1016/j.wroa.2018.100010 (open access)

26. Mondy, C., **Schuwirth**, N. (2017): Integrating ecological theories and traits in process-based modelling of macroinvertebrate community dynamics in streams. *Ecological Applications* 27 (4), 1365-1377. doi:10.1002/eap.1530

25. Paillex, A., Reichert, P., Lorenz, A.W., **Schuwirth**, N. (2017): Mechanistic modeling for predicting the effects of restoration, invasion and pollution on benthic invertebrate communities in rivers. *Freshwater Biology* 62, 1083–1093. doi:10.1111/fwb.12927

24. Honti, M., **Schuwirth**, N., Rieckermann, J., Stamm, Ch. (2017): Can integrative catchment management mitigate future water quality issues caused by climate change and socio-economic development? *Hydrology and Earth System Sciences* 21, 1593-1609. doi:10.5194/hess-2016-297 (open access)

23. Paillex, A., **Schuwirth**, N., Lorenz, A.W., Januschke, K., Peter, A. and Reichert, P. (2017): Integrating and extending ecological river assessment: concept and test with two restoration projects. *Ecological Indicators* 72, 131-141. doi:10.1016/j.ecolind.2016.07.048

22. Kattwinkel, M., Reichert, P., Rüegg, J., Liess, M., **Schuwirth**, N. (2016): Modelling macroinvertebrate community dynamics in stream mesocosms contaminated with a pesticide. *Environmental Science & Technology* 50 (6), 3165–3173. doi:10.1021/acs.est.5b04068
21. **Schuwirth**, N., Dietzel, A., Reichert, P. (2016): The importance of biotic interactions for the prediction of macroinvertebrate communities under multiple stressors. *Functional Ecology* 30, 974-984. doi:10.1111/1365-2435.12605 (open access)
20. Reichert, P., Langhans, S.D., Lienert, J., **Schuwirth**, N. (2015): The conceptual foundation of environmental decision support. *Journal of Environmental Management* 154, 316-332. doi:10.1016/j.jenvman.2015.01.053 (open access)
19. Scholten, L., **Schuwirth**, N., Reichert, P., Lienert, J. (2015): Tackling uncertainty in multi-criteria decision analysis - An application to water supply infrastructure planning. *European Journal of Operational Research* 242, 243-260. doi:10.1016/j.ejor.2014.09.044
18. **Schuwirth**, N., Kattwinkel, M., Stamm, Ch. (2015): How stressor specific are trait-based ecological indicators for ecosystem management? *Science of the Total Environment* 505, 565-572. doi:10.1016/j.scitotenv.2014.10.029
17. Rinderknecht, S.L., Albert, C., Borsuk, M., **Schuwirth**, N., Künsch, H.R., Reichert, P. (2014): The Effect of Ambiguous Prior Knowledge on Bayesian Model Parameter Inference and Prediction. *Environmental Modelling & Software* 62, 300-315. doi:10.1016/j.envsoft.2014.08.020
16. Gray, C., Baird, D., Baumgartner, S., Jacob, U., Jenkins, G., O'Gorman E., Lu, X., Ma, A., Pocock, M., **Schuwirth**, N., Thompson, M., Woodward, G. (2014): Ecological networks: the missing links in biomonitoring science. *Journal of Applied Ecology* 51, 1444-1449. doi:10.1111/1365-2664.12300 (open access)
15. Langhans, S.D., Reichert, P., **Schuwirth**, N. (2014): The method matters: a guide for indicator aggregation in ecological assessments. *Ecological Indicators* 45, 494-507. doi:10.1016/j.ecolind.2014.05.014
14. Robinson, C.T., **Schuwirth**, N., Baumgartner, S., Stamm, Ch. (2014): Spatial Relationships between Land-use, Habitat, Water Quality and Macroinvertebrates in two Swiss Catchments. *Aquatic Sciences* 76, 375–392. doi:10.1007/s00027-014-0341-z
13. **Schuwirth**, N., Reichert, P. (2013): Bridging the gap between theoretical ecology and real ecosystems: modeling invertebrate community composition in streams. *Ecology* 94, 368–379. doi:10.1890/12-0591.1
12. Reichert, R., **Schuwirth**, N., Langhans, S.D. (2013): Constructing, evaluating, and visualizing value and utility functions for decision support. *Environmental Modelling and Software* 46, 283-291. doi:10.1016/j.envsoft.2013.01.017
11. Langhans, S.D., Lienert, J., **Schuwirth**, N., Reichert, P. (2013): How to make river assessments comparable: a demonstration for hydromorphology. *Ecological Indicators* 32, 264–275. doi:10.1016/j.ecolind.2013.03.027
10. Reichert, P., **Schuwirth**, N. (2012): Linking statistical bias description to multi-objective model calibration, *Water Resources Research* 48 (9), W09543. doi:10.1029/2011WR011391 (open access)
9. **Schuwirth**, N., Reichert, P., Lienert, J. (2012): Methodological aspects of multi-criteria decision analysis for policy support: A case study on pharmaceutical removal from hospital wastewater. *European Journal of Operational Research* 220, 472-483. doi:10.1016/j.ejor.2012.01.055
8. Lienert, J., Koller, M., Konrad, J., McArdell, C.S., **Schuwirth**, N. (2011): Multiple-Criteria Decision Analysis Reveals High Stakeholder Preference to Remove Pharmaceuticals from Hospital Wastewater. *Environmental Science & Technology* 45, 3848-3857. doi:10.1021/es1031294
7. **Schuwirth**, N., Acuña, V., Reichert, P. (2011): Development of a mechanistic model (ERIMO-I) for analyzing the temporal dynamics of the benthic community of an intermittent Mediterranean stream. *Ecological Modelling* 222, 91-104. doi:10.1016/j.ecolmodel.2010.09.013
6. Reichert, P., **Schuwirth**, N. (2010): A generic framework for deriving process stoichiometry in environmental models, *Environmental Modelling and Software* 25, 1241-1251. doi:10.1016/j.envsoft.2010.03.002
5. **Schuwirth**, N., Kühni, M., Schweizer, S., Uehlinger, U., Reichert, P. (2008): A mechanistic model of benthos community dynamics in the River Sihl, Switzerland. *Freshwater Biology* 53, 1372-1392. doi:10.1111/j.1365-2427.2008.01970.x

4. Hofmann, T., **Schuwirth**, N. (2008): Zn and Pb release of sphalerite (ZnS)-bearing mine waste tailings. *Journal of Soils and Sediments* 8 (6), 433-441. doi:10.1007/s11368-008-0052-y
3. **Schuwirth**, N., Voegelin, A., Kretzschmar, R., Hofmann, T. (2007): Vertical Distribution and Speciation of Trace Metals in Weathering Flotation Residues of a Zinc/Lead Sulfide Mine. *Journal of Environmental Quality* 36 (1), 61-69. doi:10.2134/jeq2006.0148
2. **Schuwirth**, N., Hofmann, T. (2006): Methods for Metal Release Assessment in Soil Water at Anoxic Sites. *Acta Hydrochimica et Hydrobiologica* 34 (6), 579-586. doi:10.1002/aheh.200500651
1. **Schuwirth**, N., Hofmann, T. (2006): Comparability of and Alternatives to Leaching Tests for the Assessment of the Emission of Inorganic Soil Contamination. *Journal of Soils and Sediments* 6 (2), 102-112. doi:10.1065/jss2005.10.149

### Publications for Practice

**Schuwirth**, N., Caradima, B., Schindler Wildhaber, Y., & Sarbach-Remund, N. (2019): Analyse schweizweiter Makrozoobenthosdaten. Erkenntnisse über anthropogene Einflüsse und Monitoring-Design. *Aqua & Gas* 99 (12), 55-61. [Link](#)

Küry, D., Stucki, P., Martinez, N., Roth, T., **Schuwirth**, N., Michel, C., & Schindler Wildhaber, Y. (2019): Vom IBCH zum IBCH\_2019. Methoden-Update des Moduls "Makrozoobenthos Stufe F" im Modul-Stufen-Konzept. *Aqua & Gas* 99 (12), 47-54. [Link](#)

Michel, Ch., Schindler Wildhaber, Y., Leib, V., Remund, N., **Schuwirth**, N. (2017): Überarbeitung des Makrozoobenthos-Index. Natürliche Einflussfaktoren, Ursache-Wirkungsanalyse und Diskussion des SPEAR-Index. *Aqua & Gas* 97 (4), 70-77. [Link](#)

**Schuwirth**, N., Reichert, P. (2012): Predicting the occurrence of macroinvertebrates. *Eawag News* 72, 14-17. [Link](#)

Reichert, P., **Schuwirth**, N., Langhans, S. (2011): MCWM - Ein Konzept für multikriterielle Entscheidungsunterstützung im Wassermanagement. *Wasser Energie Luft* 103 (2), 139-148. [Link](#)

**Schuwirth**, N., Reichert, P. (2009): Modelling of benthic communities in rivers. *Eawag News* 66, 19-21. [Link](#)

### Teaching

- Modelling Aquatic Ecosystems, ETH Zurich, Course 701-0426-00, 2007 - 2009, yearly since 2015
- Ökomorphologische Erfassung und Bewertung der Seeufer, Practice-Oriented Eawag Course, 25 January and 4 October 2017, Dübendorf, Switzerland
- Environmental Systems Analysis, ETH Zurich, Course 701-1361-00, 2007
- Methoden des Fließgewässermanagements, Practice-Oriented Eawag Course, 21-22 October 2014, Dübendorf, Switzerland
- Bewertung von Oberflächengewässern: Vorschläge zur Weiterentwicklung und Verwendung der Bewertungsverfahren, Practice-Oriented Eawag Course, 16-17 November 2011, Dübendorf, Switzerland
- IFRM – das Integrative Flussrevitalisierungsmodell, Practice-Oriented Eawag Course, 12-13 March 2007, Dübendorf, Switzerland