

Supporting information for

A Bayesian Belief Network learning tool integrates multi-scale effects of riparian buffers on stream invertebrates

Marie Anne Eurie Forio^{1,*}, Francis J. Burdon^{2,3}, Niels De Troyer¹, Koen Lock¹, Felix Witing⁴, Lotte Baert¹, Nancy De Saeyer¹, Geta Rîșnoveanu^{5,6}, Cristina Popescu⁵, Benjamin Kupilas^{7,8}, Nikolai Friberg^{7,9,10}, Pieter Boets^{1,11}, Richard K. Johnson², Martin Volk⁴, Brendan G. McKie², Peter L. M. Goethals¹

¹Aquatic Ecology Research Unit, Department of Animal Sciences and Aquatic Ecology, Ghent University, 9000 Ghent, Belgium; marie.forio@ugent.be (M.F.); niels.detroyer@ugent.be (N.D.); koen_lock@hotmail.com (K.L.); lotte.baert@ugent.be (L.B.); nancy.desaeyer@ugent.be (N.D.S); pieter.boets@oost-vlaanderen.be (P.B.); peter.goethals@ugent.be (P.G.)

²Department of Aquatic Sciences and Assessment, Swedish University of Agricultural Sciences, 75007 Uppsala, Sweden; brendan.mckie@slu.se (B.G.M.)

³Te Aka Mātuatua - School of Science, University of Waikato, Hamilton, New Zealand; francis.burdon@waikato.ac.nz (F.J.B.);

⁴Department of Computational Landscape Ecology, Helmholtz Centre for Environmental Research-UFZ, 04318 Leipzig, Germany; felix.witing@ufz.de (F.W.); martin.volk@ufz.de (M.V.);

⁵Department of Systems Ecology and Sustainability, University of Bucharest, 050095 Bucharest, Romania; geta.risnoveanu@g.unibuc.ro (G.R.); cristina.popescu@g.unibuc.ro (C.P.)

⁶Research Institute of the University of Bucharest, 050663 Bucharest, Romania

⁷Norwegian Institute for Water Research (NIVA), 0349 Oslo, Norway; benjamin.kupilas@niva.no (B.K.); nikolai.friberg@niva.no (N.F.)

⁸Institute of Landscape Ecology, University of Münster, 48149 Münster, Germany

⁹Freshwater Biological Section, Department of Biology, Universitetsparken 4, 3rd floor, 2100 Copenhagen, Denmark

¹⁰water@leeds, School of Geography, Leeds LS2 9JT, UK

¹¹Provincial Centre of Environmental Research, Godshuizenlaan 95, B-9000 Ghent, Belgium

* Correspondence: marie.forio@ugent.be; Tel.: +329 264 90 01 (M.F.)

Supporting Information Figures

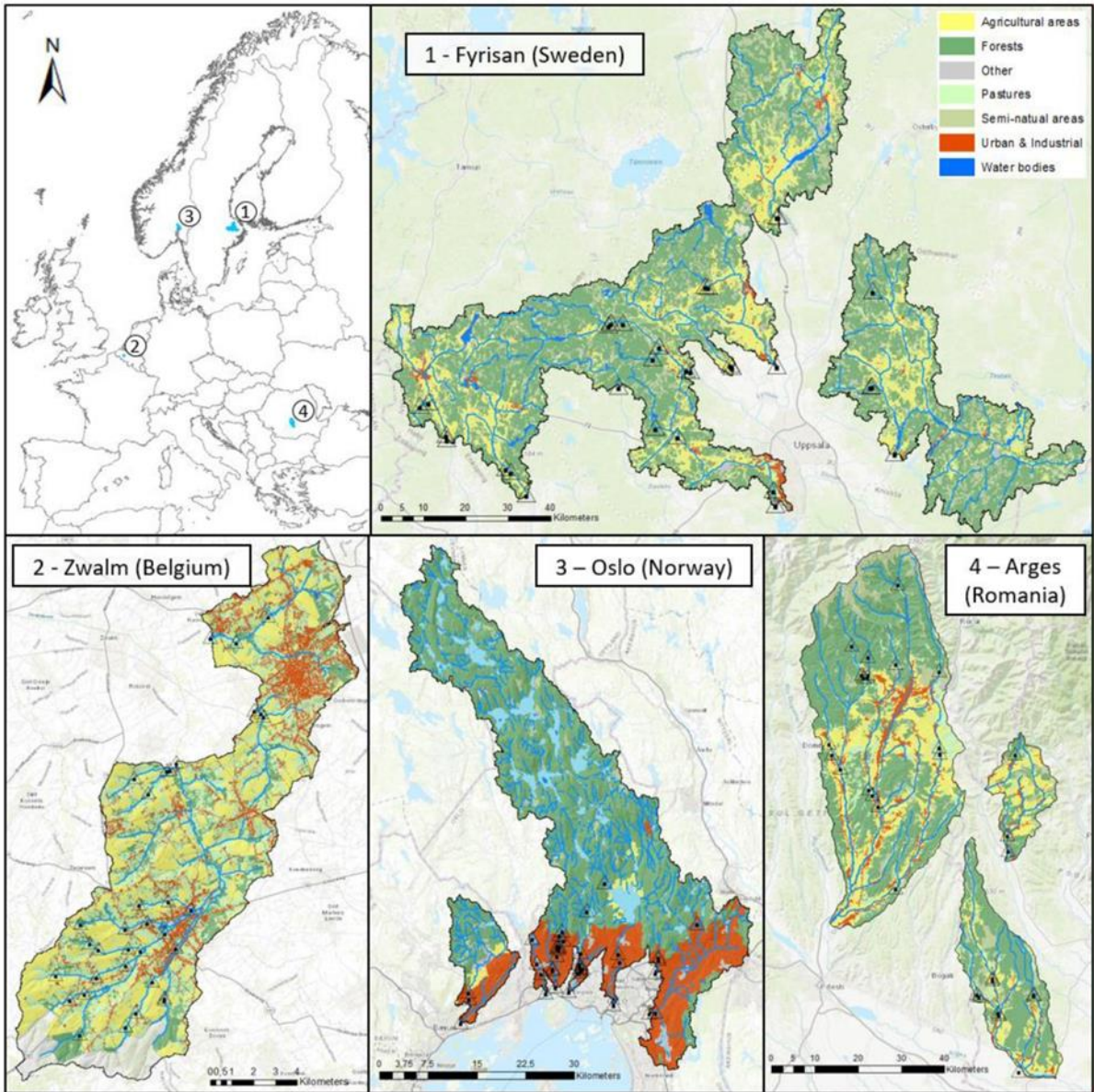


Figure S1: Map of Europe showing the locations of the four case-study catchments (1) Lake Mälaren in Sweden, (2) Zwalm in Belgium, (3) Oslo Fjord in Norway and (4) Argeş in Romania (after Burdon et al. (2020)).

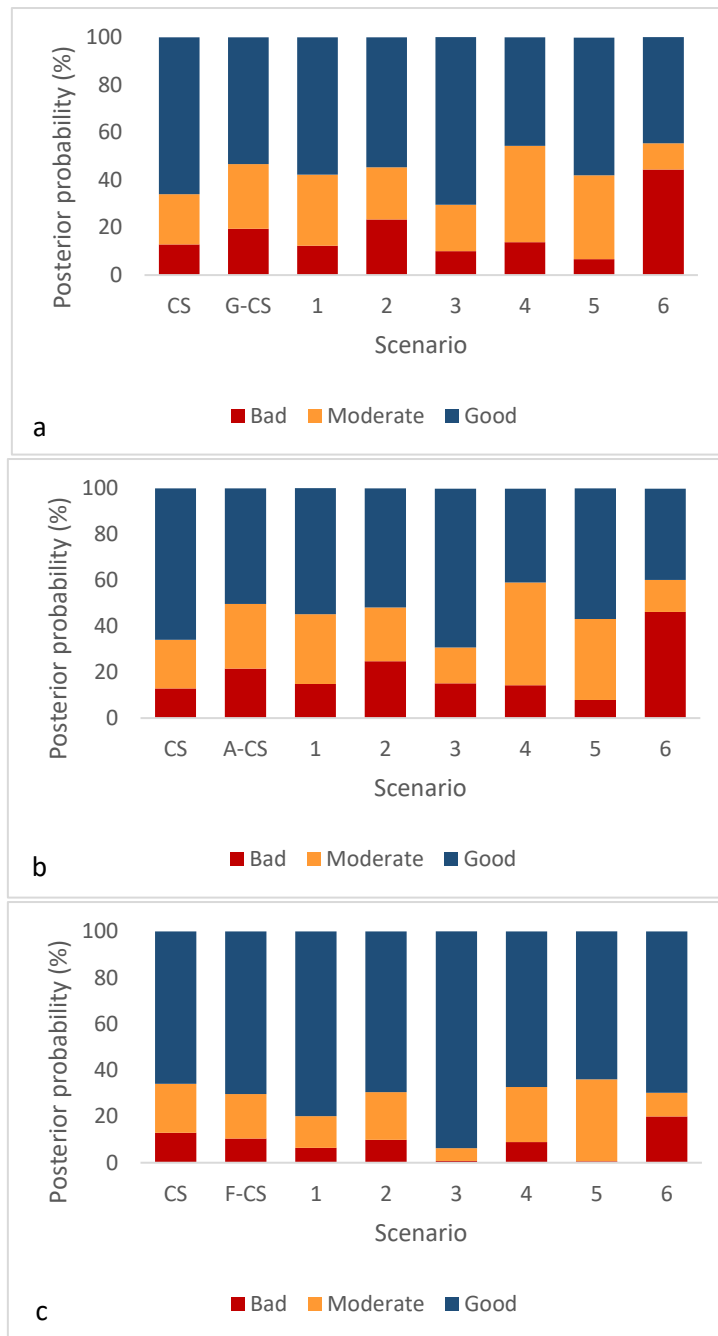
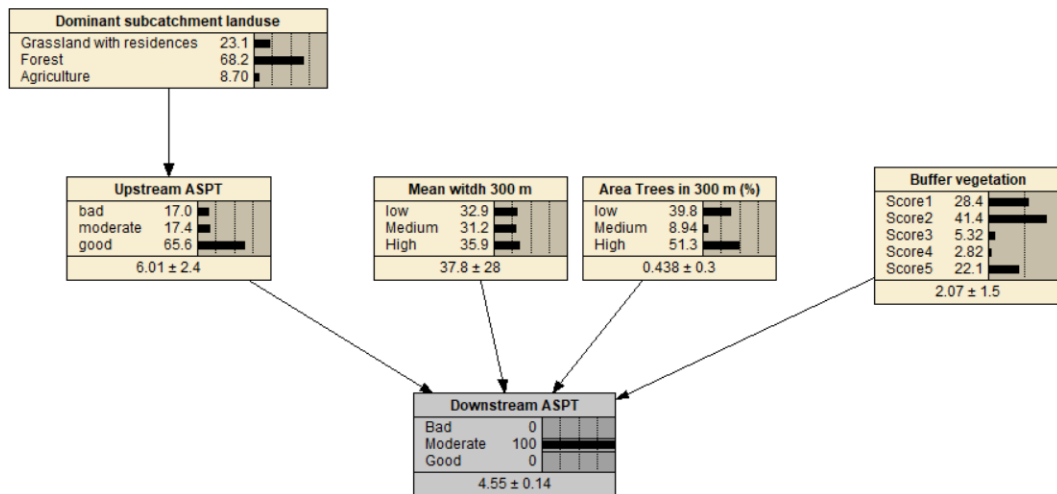
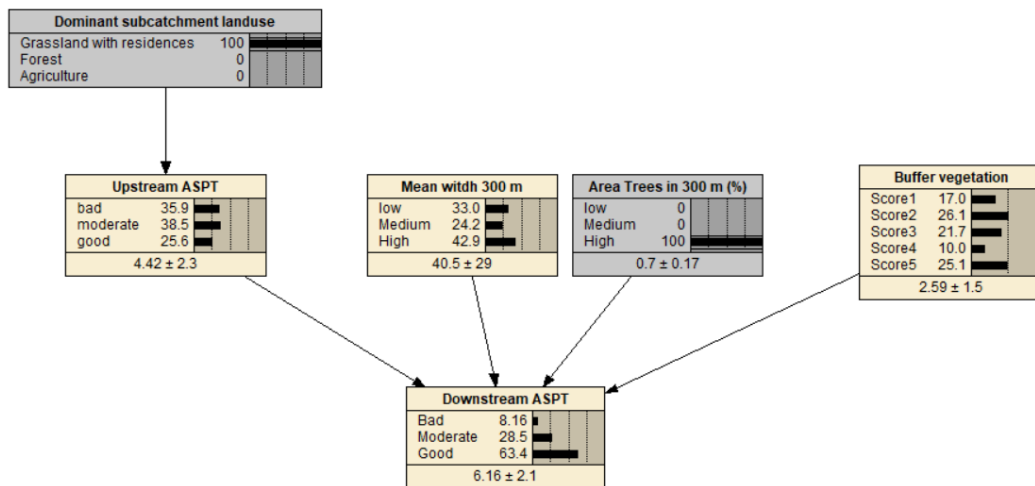


Figure S2. Model simulations for Scenarios 1-6 for grassland with residences (a), agriculture (b) and forest (c) with current conditions (CS), current conditions for grassland, agriculture and forest-dominated land use (G-CS, A-CS, F-CS, respectively).

a

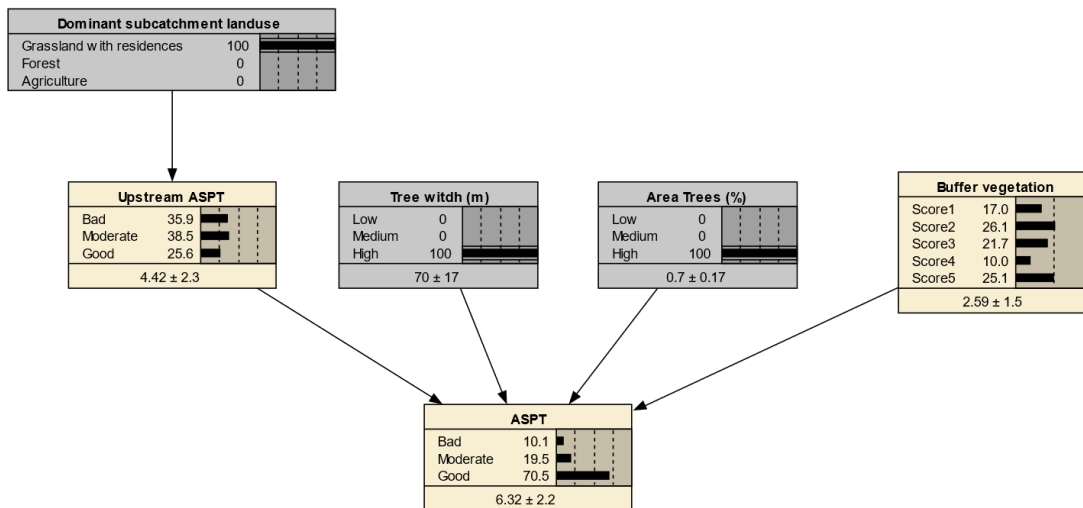


a

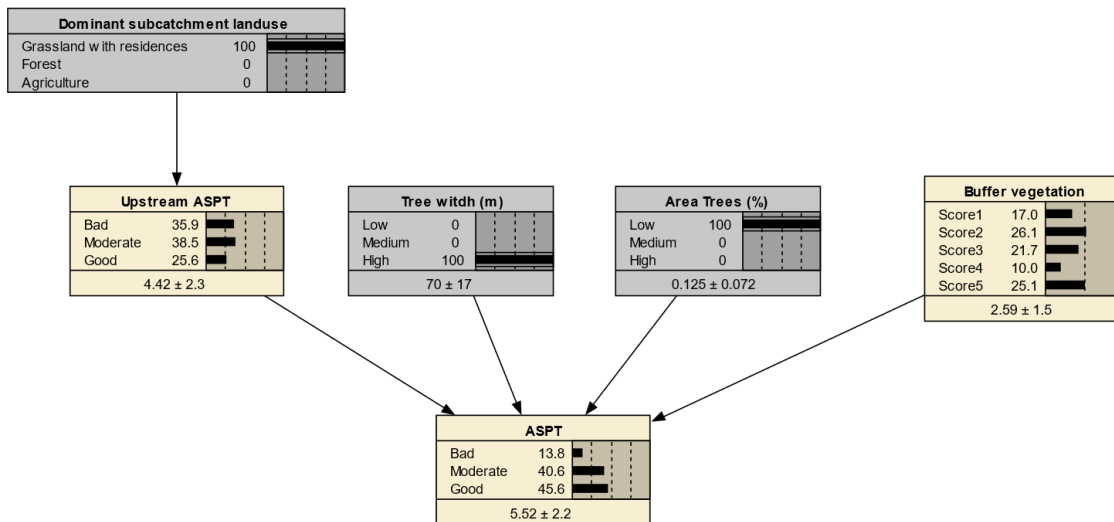


b

Figure S3. Illustration of a diagnostic inference (a) and predictive inference (b).



a



b

Figure S4. BBN model at Scenario 3 (a) and 4 (b) for grassland with residences land use.

Supporting information Tables

Table S1. Confusion matrix of the model validated with the Romanian dataset.

Predicted			Actual
Bad	Moderate	Good	
0	0	0	Bad
0	1	1	Moderate
1	0	24	Good

Table S2. Confusion matrix of the model validated with the Belgian dataset.

Predicted			Actual
Bad	Moderate	Good	
16	0	1	Bad
2	5	2	Moderate
0	0	7	Good

Table S3. Confusion matrix of the model validated with the Norwegian dataset.

Predicted			Actual
Bad	Moderate	Good	
0	0	3	Bad
0	1	2	Moderate
0	1	25	Good

Table S4. Confusion matrix of the model validated with the Swedish dataset.

Predicted			Actual
Bad	Moderate	Good	
0	0	1	Bad
0	1	5	Moderate
0	0	22	Good

References:

Burdon JF, Ramberg E, Sargac J, Forio AM, de Saeyer N, Mutinova TP, et al. Assessing the Benefits of Forested Riparian Zones: A Qualitative Index of Riparian Integrity Is Positively Associated with Ecological Status in European Streams. *Water* 2020; 12.