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Quantifying uncertainty in expert stakeholder assessment of the factors influencing some aquatic ecosystems services –analysis using Bayesian Belief Networks.

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Practical use of the Ecosystems services paradigm requires explicit linking of aquatic ecosystems services in a catchment with management scenarios. This requires a variety of models (explicit or implicit). Models that link management options with their physical effects on flows of water, contaminants and sediment are relatively well established and proven and include many different hydrological models. However the subsequent linkages between water flows and quality and individual ecosystems services are arguably more complex and certainly less well established. Here we describe the use of Bayesian Belief Networks (BBN) to establish this linkage using expert opinion for the case of some aquatic ecosystems services related to water quality and recreational fishing resources. A three step approach was used;
(i) a BBN network structure was established by domain experts who considered the relevant management scenarios, what information the hydrological models could produce, and the major influences on the ecosystems services involved.
(ii) Once a model structure was agreed, workshops were organised at which a separate group of experts, with a focus on biological/ecological expertise were asked to calibrate the BBNs by filling in the associated conditional probability tables. Since this was done by multiple groups, an analysis of the results identified areas of agreement on the strength of the relationships and areas of substantial disagreement.
(iii) The resulting calibrated BBN (using the average of the conditional probabilities from each expert group) was demonstrated to the entire workshop so that its realism could be qualitatively assessed, and in this case confirmed.