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**AWRA 2011 ANNUAL WATER RESOURCES CONFERENCE**  
**Albuquerque, New Mexico**

**November 7-10, 2011**

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**EUTROPHICATION RISK ASSESSMENT USING BAYESIAN INFERENCE TECHNIQUES**

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**ABSTRACT:** The importance of investigating the effects of uncertainty on mathematical model predictions has been highlighted in the modelling literature. The question of model credibility is important because models are used to identify polluters, to direct the use of research dollars, and to determine management strategies that have considerable social and economic implications. Erroneous model outputs and failure to account for uncertainty could produce misleading results and misallocation of limited resources during the costly implementation of environmental management plans. Striving for novel uncertainty analysis tools, we introduce Bayesian calibration of process-based models as a methodological advancement that warrants consideration in aquatic ecosystem research. One of the basic features of the Bayesian approach is the ability to sequentially update beliefs as new knowledge is available, and the consistency with the scientific process of progressive learning and the policy practice of adaptive management. Finally, we illustrate some of the anticipated benefits from the Bayesian calibration framework, well suited for stakeholders and policy makers when making decisions for sustainable environmental management, using as a case-study the Hamilton Harbour; a eutrophic system in Ontario, Canada.

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