



Managing Ecological Risks at a Heavily Impacted Site Using Population Level Risk Assessment – A Proposed Approach to Characterize Elevated HQ Values

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A population-level ecological risk assessment (ERA) can be a valuable tool for selection of remediation options and risk management planning for potential closure of heavily impacted large-area and/or remote contaminated sites. A common problem encountered with ecological risk assessment is - what is the elevated HQ value of realistic concern (e.g., an HQ value of 5, 10 or 50, etc...) at a site when based on a conservative toxicity reference value (TRV) for the protection of reproduction, which is a common and sensitive adverse effect level (i.e., endpoint) used in ERA. The assessment aims to answer what are the population-level risks associated with elevated HQ values based on exceedances of a no-observable-adverse-effect-level (NOAEL) or lowest-observable-adverse-effect-level (LOAEL)TRV. This presentation provides a viable ERA approach for a heavily impacted remote site in northern British Columbia with elevated lead concentrations in soil from historical mining. Terrestrial ecological risks to lead are often predicted to be unacceptable at contaminated sites (i.e., predicted HQ values greater than 10) based on standard fate and transport models and on regulatory TRVs (i.e., CCME or US EPA). The approach incorporated recently published updates to the avian lead TRV by Sample et al., (2019) and consideration of population modelling. Population modelling is deeply rooted in ecology, and stems from the pioneering work of Leslie (1945) wherein estimating the growth or decline of a wildlife population over time can be predicted. This population model can provide a link between individual toxic responses (i.e., reduced egg production) and population success, to reduce uncertainties in ERA and establish critical effect levels associated with potential population level decline. Dose-response data, spatial exposure estimates and population modelling will be used to determine if exposure point concentrations at an example site are predicted to have a detrimental effect on wildlife populations. The presentation will show how soil lead concentrations can be used to predict population success (positive growth) or decline (negative growth) across a study area and identify specific habitat areas meriting further assessment and/or remediation.

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Mr. Bresee specializes in human and ecological risk assessment with extensive experience in exposure modelling and risk assessments associated with contaminated sites and environmental impact assessments. Mr. Bresee has been an environmental consultant for over 20 years managing environmental impact assessments and has been the technical lead on human and ecological risk assessments of contaminated sites for Provincial and Federal sites across Canada. Mr. Bresee's role in these projects was project management, multiple pathway exposure assessment, toxicity assessment, risk characterization and stakeholder/public consultation.