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Adverse Outcome Pathways Linked to Population

Models as a Methodology for Investigating Effects of Chemical Stressors.

In addressing the complexity and toxicity of chemical contaminants in Great Lakes ecosystems, we describe an approach to link chemically induced alterations in molecular and biochemical endpoints to adverse outcomes in whole organisms and populations. Analysis of population impacts of chemical stressors through the use of modeling provides a linkage between endpoints observed in the individual (i.e. through effects based monitoring) and ecological risk to the population as a whole. Our approach employs a simple density dependent logistic matrix model linked to adverse outcome pathways (AOPs) for reproductive effects in fish of contaminants that impact different points within the hypothalamic-pituitarygonadal axis. As an example, quantitative relationships between estradiol, testosterone, and vitellogenin concentrations and fecundity established in fathead minnow (*Pimephales promelas*) 21-d reproduction studies with different HPG-active chemicals are used to forecast the effects on populations exposed to stressors that reduce vitellogenesis. A second example utilizes linked AOP and population models parameterized with long-term monitoring data for white sucker (*Catostomus commersonii*) collected from a study site at Jackfish Bay, Lake Superior to predict population trends over time, including after mitigation. **Keywords:** *Populations, Ecosystem modeling, Environmental contaminants.*