Why do Fish Mercury Concentrations Increase in the Hells Canyon Complex? A Modeling Approach

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Brownlee, Oxbow, and Hells Canyon Reservoirs together span approximately 90 miles of the Snake River along the Idaho–Oregon border. Fish sampling carried out in 2013-2014 clearly showed increasing mercury concentrations in smallmouth bass through the HCC complex, decreasing again downstream. There is interest in understanding the causes of increased fish mercury concentrations in HCC and downstream. Human influences include mining in the watershed that began in the mid-1800s, increased regional and global atmospheric mercury emissions that also began in the 1800s, upstream agriculture since the 1900s, operation of a large cement kiln roughly 10 miles from HCC, and construction of the HCC reservoirs from 1958-1967. These activities have increased mercury loading to the river system and altered conditions related to hydrology, particle dynamics, nutrient loads, system productivity, and water quality.

The USGS and Idaho Power are collaborating to better document mercury levels in HCC and understand factors governing mercury cycling and bioaccumulation. One component of the study is the development of conceptual and simulation models to help integrate field studies and better understand the effects of different factors in isolation and together. The simulation model will also be used to examine the potential effects of various scenarios on mercury cycling and bioaccumulation. The conceptual model is based on available information and is semi-quantitative. The simulation model (D-MCM) is a mechanistic mass balance numerical model.

This presentation will describe the conceptual model and plans for simulation modeling.