

## Example 3: Aquatic Risk Assessment

Dr. Onishi was a main developer of the Chemical Migration and Risk Assessment (CMRA) Methodology for Prediction of Pesticide Transport and its aquatic impact to evaluate the aquatic impacts of pesticides. The CMRA methodology consists of: (i) overland modeling, (ii) in-stream modeling with the sediment-contaminant transport codes, (iii) a statistical analysis of computed in-stream chemical concentrations and (iv) a stochastic risk assessment procedure. The CMRA methodology was applied to predict the migration (transport, deposition, and resuspension) and fate of pesticides, Alachlor and their potential short- and long-term impacts on fish in Iowa streams. It was also used to assess the impacts of the pesticide, Toxaphene applied to farmland on fish for the U.S. Environmental Protection Agency (EPA) to determine if the pesticide should be banned. EPA selected the Yazoo River basin as a representative site to evaluate the pesticide impact (See Fig. 1). The CMRA methodology predicted the dissolved (See Fig. 2) and particulate (Fig.3) Toxaphene concentrations in the Yazoo, Tallahatchie, Coldwater, and Big Sunflower Rivers in Mississippi, originally applied to farm lands on the Yazoo River basin (see Figs. 1); and potential acute and chronic damages to large-mouth bass, bluegill, sunfish, fathead minnow, and catfish in these rivers (see Fig. 4). Partially based on this study, EPA banned Toxaphene to be used in the United States.

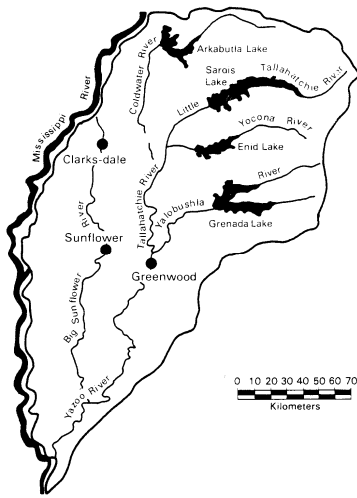


Fig. 1. Yazoo River Basin, Mississippi

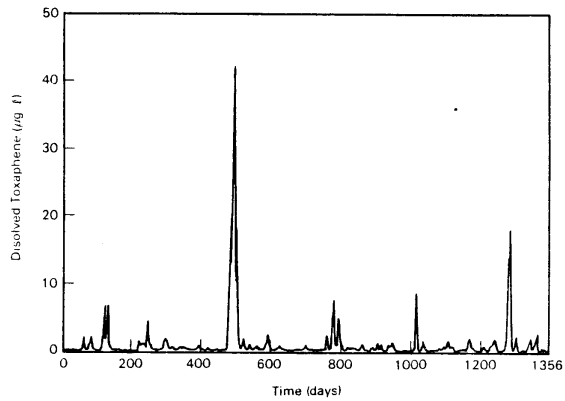


Fig. 2. Predicted dissolved Toxaphene concentration at the Yazoo River mouth

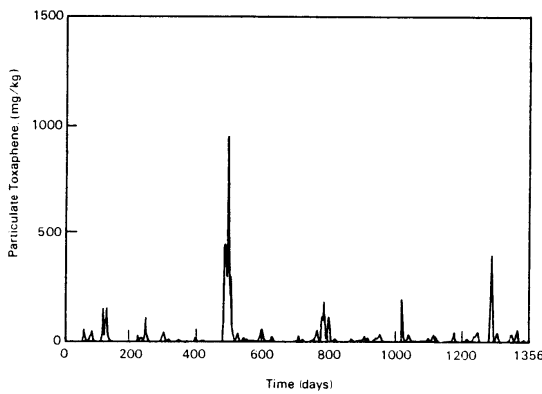


Fig. 3. Predicted particulate Toxaphene concentration

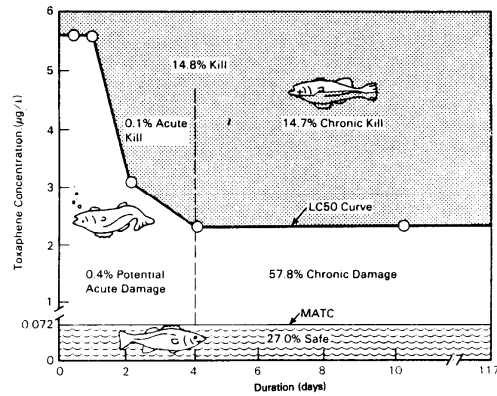


Fig. 4. Predicted acute and chronic risks to young large-mouth bass