Assessing Effects of Reservoir Operations on the Reservoir Ecosystem Using Food Web-Energy Transfer and Water Quality Models

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Abstract. A linked modeling approach was used to investigate the effects on the reservoir food web as a result of a new temperature control device (TCD) on the dam at Shasta Lake, California. The linked modeling approach used a two-dimensional reservoir water quality model (CE-QUAL-W2) to predict operation-induced changes in phytoplankton production. A food web-energy transfer model was used to propagate predicted changes in phytoplankton through the food web to the predators and sport fishes of interest. Stable isotope analysis provided an efficient and comprehensive means of estimating the reservoir's food web structure with minimal sampling and background data. An optimization procedure was used to simultaneously estimate the diet proportions of all food web components from their isotopic signatures. The linked modeling approach demonstrated the value of interdisciplinary efforts to address concerns that the individual models could not have dealt with separately.