Spokane River and Lake Spokane (Long Lake) Pollutant Loading Assessment for Protecting Dissolved Oxygen

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Abstract

The primary goal of the Spokane River and Lake Spokane (Long Lake) study was to assess the impacts of point and nonpoint sources of pollutants on dissolved oxygen concentrations to determine if the river and lake were in compliance with Washington State water quality criteria. Another goal of the study was to evaluate the existing total phosphorus criterion and associated total daily maximum load (TMDL) for Lake Spokane.

The Spokane River exhibits diurnally low dissolved oxygen levels during the summer months mainly due to periphyton growth stimulated by nutrient loading. The dissolved oxygen concentrations in the bottom waters of Lake Spokane during the summer stratification period also have been shown to be low.

Review of the historical studies used to establish the current phosphorus criterion and TMDL for Lake Spokane indicates that the criterion and loading limits are too high to protect water quality in the lake. In addition, the historical studies reported that hypolimnetic oxygen concentrations were impaired in Lake Spokane by point and nonpoint sources of phosphorus by productivity and decomposition of organic material.

A calibrated U.S. Army Corps of Engineers dynamic 2-dimensional CE-QUAL-W2 Version 3.1 model was used to simulate the hydrodynamics and water quality of the river system and to assess the effects of pollutants from both point and nonpoint sources on dissolved oxygen concentrations. The modeling results indicate that (1) in some areas of the Spokane River and Lake Spokane, dissolved oxygen violates water quality criteria during critical conditions, and (2) current loading of organic material and nutrients from both point and nonpoint sources will need to be reduced to meet the 0.2 mg/L human-caused decrease in dissolved oxygen concentrations currently allowed.