Scope of Work for Predicting Climate Change Effects on Kokanee Habitat Suitability in Lake Sammamish, Washington.

The objective of this work is to estimate the change in the amount of suitable habitat for Kokanee (*Oncorhynchus nerka*) in Lake Sammamish, Washington expected in this century due to climate change. The Lake Washington-Sammamish Watershed is one of only five watersheds in Washington with extant populations of native kokanee (Pfeifer 1995). Kokanee abundance in Lake Sammamish has declined dramatically since at least the 1970's (Berge and Higgins 2003; Jackson 2010), resulting in a petition for protection under the US Endangered Species Act in 2007. Currently, the US Fish and Wildlife Service participates in a conservation supplementation effort to attempt to rebuild the population (Lake Sammamish Kokanee Work Group 2010) and several habitat restoration efforts are planned (http://www.kingcounty.gov/environment/animalsAndPlants/restoration-projects/kokanee-chinook-projects.aspx). However, the efficacy of such restoration efforts remains unknown, given expectations for the effects of climate change on habitat suitability. Kokanee require suitable dissolved oxygen concentration and temperature conditions to survive. Berge (2009) postulated that climate change (warming) could exacerbate the spatial and temporal extent of unsuitable dissolved oxygen concentration and temperature conditions for Kokanee in Lake Sammamish. Unfortunately, like many restoration efforts (Battin et al. 2007), consideration of the effects of climate change has not been conducted. In cooperation with the King County Department of Natural resources and Parks and with the guidance of US Fish and Wildlife Service staff, we propose to adapt an existing hydrodynamic lake model (King County 2008) to predict changes in dissolved oxygen concentration and temperature for approximately fifty years based on predicted changes in climatic conditions. Climate data are available from the University of Washington Climate Impacts Group (http://cses.washington.edu/data/data.shtml). Results of this work will include predicted probabilities of absence of suitable habitat conditions for Kokanee in Lake Sammamish through the period of analysis and measures of the minimum extent of suitable habitat. These results should provide a sound, quantitative basis for making future conservation and management decisions. The resulting model and methods can also be applied to other lakes and species in the region.

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