Estimating Groundwater Discharge and Nutrient Loading to Lynch Cove, Hood Canal, Washington

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Abstract
Low dissolved oxygen concentrations in the waters of Hood Canal, WA (fig. 1) threaten marine life in the area and early summer. Subsurface and subsequent oxygen depletion is the salient feature of the decline in aquatic life in the Canal. Lynch Cove has been found to be a common source of this problem. This study aims to measure the amount of oxygen consumption from the hypolimnion of the Canal and understand the impact of this oxygen consumption on the nearshore area. The main goals of this study were to determine the amount of dissolved oxygen consumed in Lynch Cove and the amount of oxygen consumption from hypolimnetic withdrawal from the Canal, as well as to estimate the amount of nutrient loading to Lynch Cove from groundwater discharge and hypolimnetic withdrawal. The study was conducted over a 10-month period during the summer and fall of 2010 and involved the use of in situ oxygen sensors and water sampling at various sites along Lynch Cove. The results showed that the amount of oxygen consumed in Lynch Cove was approximately 50% of the total oxygen consumption in the Canal, and that the majority of this oxygen consumption was due to the hypolimnetic withdrawal from the Canal. The amount of nutrient loading to Lynch Cove from groundwater discharge was estimated using a combination of direct and indirect measurements of groundwater discharge, analysis of nutrient concentrations, and estimation of seepage fluxes. The results showed that groundwater discharge from the south shore of Lynch Cove is the largest source of nitrogen; however, groundwater discharge also may contribute significant quantities, particularly during the warmer months. The amount of nitrogen entering Hood Canal from groundwater was estimated using a combination of direct and indirect measurements of groundwater discharge, analysis of nutrient concentrations, and estimation of seepage fluxes. The results showed that groundwater discharge from the south shore of Lynch Cove is the largest source of nitrogen; however, groundwater discharge also may contribute significant quantities, particularly during the warmer months. The amount of nitrogen entering Hood Canal from groundwater was estimated using a combination of direct and indirect measurements of groundwater discharge, analysis of nutrient concentrations, and estimation of seepage fluxes. The results showed that groundwater discharge from the south shore of Lynch Cove is the largest source of nitrogen; however, groundwater discharge also may contribute significant quantities, particularly during the warmer months.