



Effects of impoundment on nutrient availability and productivity in lakes

Matzinger, Andreas, Roger Pieters, Ken I. Ashley, Gregory A. Lawrence, Alfred Wüest

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ABSTRACT: We investigate the hydraulic alteration and the effect on primary productivity of the Hugh Keenleyside Dam built at the outlet of the Arrow Lakes (British Columbia, Canada) in 1967. Three dam-induced hydraulic changes have been identified as relevant: (1) water level increase, (2) leveling of the seasonal outflow, and (3) subsurface release of water from the dam. The potential effect of these alterations on primary productivity were tested with a numerical model supported by field observations. Hydraulic modifications can reduce lake productivity by up to 40%, primarily as a result of altered flow path and allowing nutrients to pass through the reservoir without entering the productive zone near the surface. This productivity loss is comparable to the reduction caused by nutrient retention behind dams constructed upstream of the Arrow Lakes Reservoir. The combined productivity loss from both of these two mechanisms is significant and may well be responsible for the dramatic decline of kokanee (*Oncorhynchus nerka*) observed in the Arrow Lakes Reservoir in the 1990s.

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