LAYER AERATION: AN 18 YEAR REVIEW OF PRINCIPLES AND PRACTICE

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Layer aeration is a depth-discrete artificial circulation technique. The method "redistributes" water temperature (heat) and oxygen at middle depths of the water column. A "layer" is created which is bounded above and below by thermoclines. Layer aeration has been used to reduce epilimnetic nutrient loading from the hypolimnion, to restore cool water habitat suitable for cold water fisheries and as zooplankton refuge, and for optimizing water quality to supply intakes. Relative thermal resistance to mixing (RTRM) profiles have demonstrated stable stratification with multiple thermocline peaks persists.

Layer aeration of a 523 acre, 70 ft deep, eutrophic water supply lake has been performed annually since 1987. A 15-year data record identifies very significant improvements in resource quality, raw water quality, and the cost-effectiveness of water treatment. The response to layer aeration occurred in several stages. Overall, summer Secchi disk transparency increased from <1.8 m (<6 ft) to >4.6 m (>15 ft), due to elimination of bluegreen algae blooms (*Anabaena sp*. and *Aphanizomenon sp.*). Deepening of the "compensation depth" into the hypolimnion contributed to restoration of 3300 acre-ft of aerobic cool water habitat. The habitat improvement resulted in the re-establishment of large-bodied Cladocera (*Daphnia* sp.) and further water quality improvements. Water supply benefits included elimination of prechlorination (reducing DBP formation), decreased TOC, extended granular activated carbon (GAC) bed longevity, avoidance of taste and odor episodes, and reduced treatment cost. Several cases are reviewed with applications for fishery restoration, lake management, and water supply reservoirs.