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Seasonal and longitudinal nutrient limitation patterns in watershed influenced by irrigation delivery and return flow

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Abstract 190 words

Irrigation deliveries from mountain reservoirs that capture snowmelt support agriculture in the Yakima River Basin of Washington state. Prior studies document the steady downstream degradation of water quality in the river from increased nitrogen and phosphorus loads associated with irrigation return flow. Moreover, these studies found lower stream water N:P ratios during irrigation season as low nutrient snowmelt was delivered, and higher N:P ratios shortly after irrigation season ended as shallow ground water discharged NO3- rich water back to streams. We hypothesized that the longitudinal degradation of water quality would relieve nutrient limitation in downstream ecosystems and that the seasonal change in environmental N:P ratios would cause different nutrient limitation patterns during and after irrigation season. The most common nutrient limitation responses were nitrogen limitation of respiration (8 of 12 assays) and silica limitation of production (5 of 12 assays). We did not see downstream nutrient limitation relief, likely because biofilm nutrient demand never saturated. However, nutrient demand was more likely to differ between summer and fall in the sites most affected by agricultural return flow indicating that water management in this basin can change biofilm nutrient demand.