THE INFLUENCE OF IRRIGATION FLOWS ON MICROBIAL AND ALGAL NUTRIENT LIMITATION

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In watersheds with irrigated agriculture, water sources shift seasonally, from return flows during irrigation season to shallow groundwater during non-irrigation season. We investigated the effect of irrigation on stream algal and microbial communities in tributaries of the Yakima River in central Washington, USA. We deployed nutrient-diffusing substrates (NDS) in both irrigation and non-irrigation season across 5 tributary streams. The NDS were topped with either glass discs (autotrophs) or cellulose sponges (heterotrophs). We amended the NDS with nitrogen, phosphorus, and silica in a factorial design, and deployed in each stream for at least 1 week. After retrieval, we measured photosynthesis (GPP), respiration (ER), and chlorophyll-a concentration. During irrigation season, nutrient addition either increased GPP and ER or had no effect, suggesting that microbial communities had additional capacity for assimilation. During non-irrigation season, GPP and ER were much lower and nutrient additions either inhibited GPP and ER or were neutral. Microbes and algae may have been limited by sunlight and water temperature during the cooler and low-light non-irrigation season. Overall, our results suggest a high capacity for biological nutrient uptake during irrigation season, which is potentially important for maintaining water quality.