Response of stream macroinvertebrate production to atmospheric nitrogen deposition and channel drying

Chadwick, Michael A., Alexander D. Huryn

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ABSTRACT: We assessed the effect of atmospheric nitrogen (N) deposition on secondary production in a first-order intermittent stream at the Bear Brook Watershed in Maine (BBWM). BBWM is a paired-catchment experiment designed to determine the effects of N deposition on a forested ecosystem. Nitrogen as $(NH_4)_2SO_4$ has been applied to the treatment catchment since 1989, with the adjacent catchment serving as a reference (both are drained by a first-order intermittent stream). Secondary production and detritus biomass were quantified for 2 yr. Production did not vary between streams (range = 1.7-2.3 g ash-free dry mass m^{-2} yr^{-1}) but was ~35% higher for both streams in the second year. The distribution of production among functional feeding groups varied little between streams but differed among taxa. Detritus biomass was similar between streams but was ~25% higher in the second year. The $(NH_4)_2SO_4$ treatment had no effect on production in the treatment stream. The statistically identical level of production between streams is presumably because of similar habitat, channel drying, and trophic resources. Difference in production between years was positively related to detritus biomass. Differences in the distribution of production among taxa between streams were likely the result of contrasts in the duration of flowing water, with the treatment stream having the longer duration. Our study indicates that patterns of litter input and channel drying, rather than N deposition, control levels of secondary production in these intermittent streams by altering both resource availability and community structure. These variables apparently override the effects of N deposition in regions where nitrogen is not a limiting nutrient.

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