

Stream Algae Nutrient Limitation Along an Elevation Gradient in the Poudre Watershed, Colorado

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Abstract. Streambed algae are important primary producers in lotic ecosystems. However, excess algae can harm aquatic communities by leading to depletion of dissolved oxygen. Algal growth is often limited by nitrogen, phosphorus, or both, and identifying factors that modulate nutrient limitation is critical for effective stream management. In summer 2015, vials filled with nutrient-diffusing agar (N, P, N+P, Control) were deployed in seven mountain streams in the Poudre watershed, spanning an elevational gradient of 2000 to 3200 meters. In two streams, treatments were deployed in both slow and fast current velocities. Algae was measured after 21 days. Nutrient limitation of each stream was assessed using one-way ANOVAs and contrasts of control versus treatment means. One stream was N-limited ($p < 0.01$), and two streams were N+P-limited ($p = 0.01$ and 0.04). Slow velocities had higher treatment responses than fast velocities in the two streams with duplicate treatments. The magnitude of N response was associated with stream elevation rank ($R^2 = 0.69$, $p = 0.02$), and the magnitude of N+P response was associated with dissolved oxygen ($R^2 = 0.54$, $p = 0.09$). This preliminary work highlights the need to account for current velocity and other environmental factors when assessing stream nutrient limitation. Future work will investigate how current velocity, background nutrients, and insect grazers interactively control results of nutrient limitation experiments.