

Environmental factors affecting stream metabolism in two agricultural areas of the western United States.

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In 2001, the U.S. Geological Survey's National Water-Quality Assessment Program began a National study of nutrient-enrichment effects on agriculturally affected stream ecosystems. Although inter-biome comparisons of whole-stream metabolism have been conducted for undisturbed streams, this study included estimates of metabolism for substantially-altered systems. Study results within two ecoregions in the western United States indicate that total nitrogen and phosphorus concentrations varied from 0.1 to 18.0 mg/L, and 0.003 to 1.33 mg/L, respectively. Preliminary measurements of primary production ranged from 0.1 to 12.51 g O₂/m²/d, and community respiration from 0.44 to 44.8 g O₂/m²/d. Data from 16 streams indicated that three streams were autotrophic with positive net production and production-to-respiration ratios (P:R) greater than 1, and six streams were strongly heterotrophic with P:R values <0.25. No environmental factors were found to be significantly related to primary production when all sites were included; however, within individual ecoregions, factors explaining the most variation in primary production included agricultural disturbance (e.g., grassland cover), total nitrogen concentrations, stream velocity, and alkalinity. With all sites combined, respiration rates were most related to vegetative cover and several flow characteristics. Within individual ecoregions, water temperature, suspended sediment, and vegetative cover explained most of the variation in respiration estimates.