Autochthonous and Allochthonous Carbon Cycling in a Eutrophic Flow-Through Wetland

Abstract

Wetland environments are important sites for the cycling and retention of terrestrially derived organic matter and nutrients, the influx of which subsidizes wetland C sequestration, as well as fueling autochthonous C productivity. Wetland treatment of agricultural runoff has been shown to improve water quality and promote carbon sequestration. However, the potential role of eutrophic wetlands as a source of algal loading contributing to downstream hypoxia has prompted interest in understanding algal productivity and export from these systems. This study in the San Joaquin Valley, California quantified a mass balance of carbon and nutrients within a seasonally-saturated constructed wetland receiving agricultural runoff, as well as quantifying autochthonous carbon production on five sampling dates during a year with minimal emergent vegetation. Results from this study show that the wetland was a net-sink for nutrients and particulate/dissolved organic carbon. Despite high concentrations of inflowing nutrients and high rates of primary productivity, high respiration rates limited net organic C production and export from this wetland due to high heterotrophic activity during the period of highest gross primary productivity (GPP). The addition of high C loads in inflowing water and moderate retention efficiencies (47% retention particulate organic C), however, resulted in a positive C retention during most sampling dates. This study provides valuable insight into the connection between elevated carbon and nutrient inflows, their effects on autochthonous carbon production, and resulting carbon and nutrient outflows.

CONTACT: Jonathan Maynard, NHEERL/ Western Ecology Division, TEL: 541-754-4738
maynard.jonathan@epa.gov