Abstract

Are North Temperate Wetlands A Persistent Net Source of Atmospheric CO_2? Component and Whole-System CO_2 Fluxes in a Landscape Mosaic

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Our overall objective in this research is to improve our knowledge of the magnitude, direction, and environmental drivers of CO_2 exchange in wetlands, ecosystems which have been poorly studied and are potentially key in regional, continental, and global carbon balances**.** This research will quantify the relationships between CO_2 exchange and underlying environmental factors that vary on daily, seasonal, annual, and longer time scales, to identify the relative influence of species, terrain position, disturbance, and climate on carbon balance, and help quantify the carbon balance of terrestrial ecosystems in the United States.

The research will be conducted in Price and adjacent counties in north central Wisconsin, at or near a set of three flux towers. Primary study sites will be located near the Lost Creek flux tower, an 8-meter eddy flux facility in an 800 hectare alder/sedge fen. A smaller set of flux measurements will be collected at a regional tall tower and a deciduous canopy flux system. Supporting chamber flux, vegetation structure, chamber flux, and biometric productivity measurements will be collected in and adjacent to the flux towers.

We will test the hypotheses that clearcuts and wetlands are primary sources of net ecosystem carbon flux to the atmosphere, and that variation in this flux is primarily driven by interannual variation in water balance and temperature. Longer, warmer, drier growing seasons will lead to an increase in net ecosystem to atmospheric C export, primarily due to increased aerobic decomposition in wetlands.

Eddy flux, chamber flux, biometric, and meteorological measurements will be combined to estimate component and net carbon exchange in a number of vegetation types, landscape positions, and time periods. Chamber flux and biometry will be used to develop multiple, independent measures of component and whole systems flux in the primary wetlands vegetation types of the region. A biomass accumulation/surface flux method will be compared to eddy flux measurements in a test of convergence. Data from both methods will be combined with vegetation structure and meteorology to identify primary controls on flux variation and to develop and test plant environment models of carbon exchange.

We propose to quantify net flux in important but understudied northern wetland ecosystems, and develop means to estimate present and future carbon balance in these systems. Results will be spread through peer-reviewed journal articles, and data placed in the appropriate national data archives, primarily the ORNL-DAAC