GREENHOUSE GAS PRODUCTION AS POLLUTION TRADE-OFFS IN NEW YORK WETLANDS AND SOURCE WATER STREAMS

Start / End dates: 03/13-12/14 (with no cost extension)

Principal Investigator: P. Vidon.

Objectives:

As indicated in last year’s report the objectives of this project were 1) to determine total N\(_2\)O, CO\(_2\), and CH\(_4\) fluxes (positive or negative) in streams and wetlands in relation to greenhouse (GHG) fluxes in the surrounding landscape, both seasonally, and during key hydrological events, and 2) to determine the variables driving GHG dynamics in streams and wetlands (e.g. stream flow, water table depth, oxidation-reduction potential, temperature, nutrient concentration).

With this research, we also intended to determine to what extent streams and wetlands in forested NY source watersheds are “hot spots” of GHG production in the landscape (in relation to their surrounding upland environment) and which variable(s) (e.g. climate, nutrient availability) drive(s) GHG dynamics (CO\(_2\), N\(_2\)O, CH\(_4\)) in these systems.

Activity Report

As of today, all fieldwork has been completed, and two masters’ theses partially supported by this research were completed or are near completion. Several manuscripts are currently in preparation based on the work supported by this project. Although data analysis is on going, some preliminary conclusions are noteworthy and are therefore included in this report.

In general, our data indicate that headwater stream water was hyper-saturated for CO\(_2\), N\(_2\)O and CH\(_4\) gases. For instance, in summer 2014, a mean CO\(_2\) concentration of 88.25 µmol/L (1520.5 µatm), a mean CH\(_4\) concentration of 1.16 µmol/L (554 µatm) and a mean N\(_2\)O concentration of 0.02 µmol/L (µatm) were observed in the stream. These are 5.8, 432, and 2.3 times in excess of atmospheric equilibrium, respectively.

Especially high values of dissolved CH\(_4\) were found in mucky and wet riparian sites and in the pools with fine textured bed sediments relative to other locations. CH\(_4\) was strongly negatively related to DO, while N\(_2\)O was strongly positively to NO\(_3\) and negatively related to NH\(_4\)\(^+\).

When fluxes at the soil or water interface with the atmosphere are measured, average CO\(_2\) fluxes ranged from 0.15-2.54 gC/m\(^2\)/day, with higher fluxes occurring at headwater sites. Average CH\(_4\) fluxes ranged from -0.05 to 768 mgC/m\(^2\)/day with negative flux values occurring at some of the upland sites. On the contrary, lowland and wetland sites were the largest contributors of CH\(_4\) to the atmosphere.
When the relative contribution of each GHG is expressed in CO$_2$ equivalent, we find that CO$_2$ is the main proponent of CO$_2$eq flux at all areas of the landscape except for the wetland, where CH$_4$ contributes >80% of the positive CO$_2$eq flux.

On a seasonal basis, summer, spring, autumn, and winter accounted for 40%, 24%, 27%, and 9% of the net annual flux, respectively.

**Graduate and Undergraduate Student Training** (2 Graduate Students, 2 Undergraduate Students)

**Conference Presentations**


**Thesis partially supported by work conducted under this award**

Satish Serchan. Target graduation: Summer 2014. Title: TBD

Joshua Gomez. MS thesis. Title: Soil-atmosphere carbon dioxide, methane, and nitrous oxide fluxes across time and space in a forested watershed. Spring 2014

**Peer Reviewed Publications**

Four publications are in preparation and will be submitted in 2014/2015.