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ABSTRACT TITLE: Carbon Dynamics of the Greater Everglades Watershed and Implications of Climate Change

ABSTRACT: Our newly funded project is focused upon four main objectives, 1) quantification of above- and belowground carbon stocks of terrestrial ecosystems along a hydrologic gradient in the headwater region of the Greater Everglades watershed, 2) development of budgets of ecosystem gaseous carbon exchange (CO_2 and CH_4) across the hydrologic gradient, 3) assessment of the impact of climate drivers on ecosystem carbon exchange, and 4) parameterization of climate-driven terrestrial ecosystem carbon models to estimate regional carbon cycling and examine the potential influence of projected future climate change. A multidisciplinary array of ecological, hydrological and geophysical sampling techniques at multiple spatial scales of measurement is being implemented, including eddy covariance (H_2O/CO_2 and CH_4), closed chamber gas exchange, passive experimental warming and drying, ground penetrating radar (GPR), vegetation and biomass assessment, root productivity and turnover, and soil decomposition assays.

Our network of study sites consists of three ecosystems with contrasting hydrologies: 1) a pine flatwoods site at the Disney Wilderness Preserve (DWP), 2) a seasonal depression marsh at DWP and 3) a sawgrass marsh at the Blue Cypress Preserve. During this first year of the project (and as part of ongoing work), the pine flatwoods has been well characterized for aboveground biomass, litter, and ground cover, and preliminary root cores have been taken to estimate belowground biomass and carbon content of the soil. Ongoing carbon flux measurements have shown this ecosystem to serve as a net C sink even with a prescribed fire event, with annual net ecosystem productivity (NEP) ranging from 237-508 g C m^{-2}. Continuing carbon flux measurements in a saw grass marsh site at the Blue Cypress Preserve also indicate a strong carbon sink with NEP ranging from 180-710 g C m^{-2}.

Ground penetrating radar (GPR) surveys have been initiated in order to map belowground carbon stocks. A method for detecting underground roots has been tested at the pine flatwoods site and a set of preliminary GPR profiles were also collected at the sawgrass marsh site in order to test the ability of GPR to detect changes in peat thickness at large field scales (~100-1000 meters). Chamber-based measurements of gas exchange will commence shortly in order to characterize heterogeneity of carbon fluxes and partition the net exchange amongst above- and below-ground components.

Regional implications of climate change will be investigated through deployment of open top chambers to warm and dry plants and soil at each eddy covariance site. As well, a preliminary carbon dynamics and sequestration model, based upon the G'DAY model has been developed and will be parameterized using data from the towers, chamber measurements, GPR, as well as soil and vegetation samples. The suite of measurement and modeling techniques in place at our central Florida sites will yield a much greater understanding of carbon cycling in the upper-Everglades watershed and Florida as a whole.