

Observing Carbon Fluxes and Potential Climate Change Impacts from Forest Land Management in Wisconsin

SUMMARY: The carbon sequestration capacity of Wisconsin's forests is a major natural asset in the state and how property owners manage these forests can impact this capacity. This study is intensively measuring and modeling carbon sequestration in a north temperate hardwood forest as it undergoes a forest harvest to better predict how future management actions will influence forest carbon cycling.

ABSTRACT: Forestry is a major industry in Wisconsin, and there is growing interest in learning how to align forestry with adaptation to and mitigation of climate change. Yet, little is known about whole ecosystem carbon fluxes in typical forest management scenarios. The goal of this research proposal is to quantify the flux of carbon in Wisconsin forests undergoing land management. The objective is to understand how land management alters the carbon cycle of forest ecosystems in Wisconsin and investigate how well we can predict carbon cycle impacts of differing land management scenarios.

I propose to 1) measure pre-, during, and post- harvest carbon fluxes in a Wisconsin hardwood forest, 2) analyze the impact of this management on carbon fluxes, and 3) compare these findings to a state-of-the-art landscape ecosystem model. I hypothesize that the harvest will initially cause the ecosystem to release carbon, but soon sequester carbon at rates larger than pre-management. Comparison with forest product lifecycle analyses and bioenergy potentials will be used to place these carbon flux changes in economic context.

Currently, the U.S. Forest Service (USFS) is planning a large forest thinning and harvest in the Chequamegon-Nicolet National Forest (CNNF) near Park Falls, WI. In the same area, atmospheric flux observations have been made by the Desai lab from 2000-2006 to quantify the land-atmosphere CO₂ flux. Seed funding from the USFS is restarting this tower site in late 2009. However, the funding is only sufficient for initial observations in the pre-management phase.

This proposal would support instrumentation, labor, data analysis, and reports about land management and impact on carbon fluxes at this hardwood site and compare findings to other non-managed forest carbon fluxes and a state-of-the-art forest landscape model parameterized for N Wisconsin. Cost sharing in terms of supplementary research activities by the lab and partners is expected.

I expect to produce 2-3 peer-reviewed publications, a guide to measurement of carbon fluxes during management, and data output products and figures available by public website. Additionally, relevant implications of our findings will be reported to the U.S. Forest Service and Wisconsin Focus on Energy and presented at regional and national meetings.

PRINCIPAL INVESTIGATOR: Ankur Desai, University of Wisconsin-Madison