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Week 10

The Great Pacific Northwest Carbon Sink: **Grab Your Clogs, It's Time to Dance**

“When you are up to your ass in alligators, it is difficult to remind yourself your initial objective was to drain the swamp.”

-Anonymous

Introduction

Historically, the Pacific Northwest has been the hot bed of ecological, philosophical, and political discourse over environmental and biological degradation of forest resources. Whereas the primitive call for conservation has focused on the aspects of aesthetic beauty and recreation, thereby spurring the creation of reserves in the form of State and National Parks, National Forests, Wildernesses, Wild and Scenic Rivers, and wildlife refuges, this reclamation has had limited impact on timber harvest and forest management techniques across spatial and temporal scales. However, modern conservation has been ignited by the Endangered Species Act, and subsequent management techniques aimed at protecting habitats of endangered species and biodiversity are now influencing the harvest and utilization of our nation's forest resources. Most recently, Turner et al. (2011) are forcing forest management into the most important arena of all: climate change.

What and How

The drastic, sharp reduction in timber harvest due to the adoption of the regional Northwest Forest Plan (NWFP) in 1993 serves as an excellent case-study for the analysis of change in forest carbon fluxes across time and space. Although carbon sequestration is of no concern in the NWFP, it has certainly been an unintended consequence. Seizing the opportunity to demonstrate carbon sequestration as an important ecosystem service, Turner et al. (2011) set out to estimate the change in annual carbon fluxes due to reduced timber harvests in the Pacific Northwest.

The analysis improved upon traditional models of net ecosystem production (NEP) by incorporating harvest removals (HR) and direct forest fire emissions (FE) to form an accurate estimation of net ecosystem carbon balance (NECB). Thus, comparisons of NECB between periods of intensive harvest (1985-1989) and subsequent periods of reduced harvest (1995-1999 and 2003-2007) would illustrate how reduced timber harvest has affected regional terrestrial carbon sequestration.

Variables for simulation were numerous and robust in both temporal and spatial scales, incorporating the entire region west of the crest-line as outlined by the USFS Northwestern Region 6 boundaries over a 23-year period. Most impressively, perhaps, was the inclusion of privately held forest lands, which slightly eclipses public forest

inventories by 4% of total regional forest cover. Other variables included “daily climate data, soil texture and depth, land cover type and stand disturbance history.” Data was incorporated from a large array of federal, state and academic resources.

Findings

Not surprisingly, results revealed that regional NECB was much higher after the sharp reduction in timber harvest. However, the extent to which NECB differed between the peak-harvest period and the new reduced-harvest era was dramatic. In the late 80’s, NECB was largely negative due to large scale harvest of old-growth on public lands, representing a carbon source of $-48 \text{ gC m}^{-2} \text{ year}^{-1}$. In contrary, most recent estimates (2003-2007) show reduced harvest has resulted in a $136 \text{ gC m}^{-2} \text{ year}^{-1}$ carbon sink. This is where we put on our dancing shoes; can’t you hear the earth music?¹

It should be noted that carbon source contributions from forest fires were relatively negligible, with the Biscuit Fire releasing only 4.9 TgC into the atmosphere and only .2 TgC year⁻¹ were released during the 1995-1999 time period. Dance on!

Implications

The implications of Turner et al.’s study are vast, far reaching and beyond the scope of this paper, but they emphasize the sequestration of carbon as a side-affect of the NWFP, “In this study, we established a remote sensing/modeling framework for assessing the ecosystem service of carbon sequestration within a regional socioecological system in which the additional ecosystem service of maintaining biodiversity was of interest.”

Perhaps if attention to carbon fluxes were incorporated into future forest management plans, forests could play a pivotal role in the discussion of climate change at the national and international level. Moreover, line officers managing public stands can relax their fears that uncontrolled wildfires and prescribed burning regimes may have large scale impacts on carbon fluxes, especially over the long term.

Reference

Turner, David P; Ritts, William D; Yang, Zhiqiang; Kennedy, Robert E; Cohen, Warren B; Duane, Maureen V; Thornton, Peter E; Law, Beverly E; 2011.
Decadal trends in net ecosystem production and net ecosystem carbon balance for a regional socioecological system; Forest Ecology and Management, Volume 262, Issue 7, pp. 1318 – 1325

¹ Now, stop the music! Other studies may reveal these carbon gains were simply displaced by shifting demand for deforestation to other parts of the nation or globe. Nevertheless, Turner et al.’s revelations have explicitly linked forest management to atmospheric concentrations on bioregional levels, the climactic implications of which will restructure humankind’s self-awareness.