QUANTIFYING CARBON SEQUESTRATION IN FOREST PLANTATIONS BY MODELING THE DYNAMICS OF ABOVE- AND BELOW-GROUND C POOLS

Chris A. Maier and Kurt H. Johnsen

Chris A. Maier, Research Biological Scientist, Southern Research Station, USDA Forest Service, Research Triangle Park, NC, 27709
Kurt H. Johnsen, team leader, Southern Research Station **(Note: If more than one author is at the same address, do not repeat the address)**

Extended Abstract--Extended abstracts are limited to 1000 words, one figure and one table. As they are an extended abstract; no first order headers should used (i.e. INTRODUCTION, MATERIALS AND METHODS, etc.) with the EXCEPTION of LITERATURE CITED. Follow instructions for complete papers for formatting pages, fonts, figures and tables.

Intensive pine plantation management may provide opportunities to increase carbon (C) sequestration in the Southeast USA. Developing management options that increase fiber production and soil C sequestration require an understanding of the biological and edaphic processes that control soil C turnover. Belowground C resides primarily in three pools: roots, necromass (litter, roots), and soil. There is little evidence that intensive management affects mineral soil C.

Forests are being considered as one option for stabilizing or reducing atmospheric CO_2. Forests can reduce atmospheric CO_2 by storing C in biomass, soil, and products and can be used as biofuel offsetting fossil fuel (Birdsey and Heath 2001). However, forests grown into perpetuity will provide no long-term CO_2 reduction because eventually C losses will equal or exceed C gain. Management of forest C sequestration should be viewed as a temporary mitigation effort spanning 50-100 years as new technologies to store C or reduce C emissions are developed. Carbon capture in forest growth provides a low cost approach for meeting state and national C sequestration goals and can be accomplished with available technology.

We empirically modeled loblolly plantation C dynamics of four C pools: aboveground biomass, coarse roots, root necromass, and soil matrix organic matter (Figure 1). We then compare simulated multiple-rotation C sequestration for stands receiving different levels of management. The WC and FWC stands maintained 10.7 and 16.3 Mg C ha^{-1} y^{-1} more belowground C, respectively, than did the NT over the project period (Table 1).

LITERATURE CITED

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Table 1--Simulated mean integrated carbon storage over a 60-year project period. Carbon (C) storage in aboveground, belowground, and harvested biomass are compared for 20-year and 15-year rotations for stands under a range of treatments: no treatment (NT), weed control (WC), and fertilization plus weed control (FWC). Δ BG is the increase in belowground C storage compared to NT.

Treatment	**Rotation (years)**	**Total C Storage**	**Aboveground C Storage**	**Belowground C Storage**	**Δ BG**	**Harvested Biomass**
		-----------------------------Mg C $ha^{-1}yr^{-1}$--------------------------				**Mg C ha^{-1}**
NT	**20**	28.0	14.8	13.2		197.1
WC	**20**	61.9	38.0	23.9	10.7	271.8
FWC	**20**	80.7	51.2	29.5	16.3	340.8
WC	**15**	54.4	28.0	26.4	13.2	344.0
FWC	**15**	72.9	39.8	33.1	20.0	438.4

FIGURE CAPTIONS

Figure 1--Conceptual changes in carbon storage in a pine plantation in aboveground and belowground pools over a 25-year rotation. Changes in soil matrix carbon reflect changes in the organic matter carbon pool above a baseline.

FIGURES

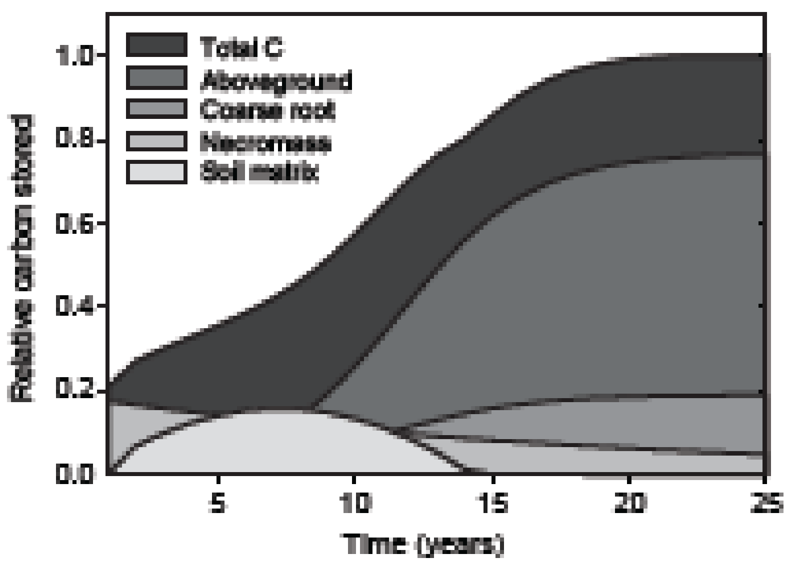

Figure 1