

A comparison of soil CO₂ efflux of *Pinus taeda* and the partitioning of respiration components

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ABSTRACT: Terrestrial ecosystems can sequester large amounts of carbon from the atmosphere where it can then be stored or respired back to the atmosphere. Respiration occurs both aboveground and belowground. Belowground respiration occurs in two forms: autotrophic (roots) and heterotrophic (microbes). Loblolly pine plantations are common and highly productive ecosystems found throughout the southeastern United States. In order to maximize the productivity of these ecosystems, we must determine the rate of soil respiration, or CO₂ efflux, and how much is attributable to autotrophic components. We hypothesized that a steady state of soil CO₂ efflux within root exclusion collars would be reached after approximately 60 days and that about 84% of soil CO₂ efflux would be due to heterotrophic components. The objective of this study was to measure soil CO₂ efflux and to determine the amount of soil CO₂ efflux from heterotrophic and autotrophic components and compare that with the results of an earlier study. Our site was located in a managed loblolly pine plantation in McCurtain County, OK. Root exclusion collars (32cm long by 10cm diameter) were installed in the ground to sever and exclude roots. Soil CO₂ efflux was measured using an infra-red gas analysis system (Li-Cor 8100). Measurements were conducted bi-weekly from June through August, 2014 concurrent with soil temperature measurements at 10 cm depth. Further, heterotrophic and autotrophic respiration was partitioned using measurements conducted both inside and outside of the collars. This allowed us to compare total respiration (outside the collar) to heterotrophic respiration (inside the collar) and calculate autotrophic respiration as the difference. Our results suggest that a steady state of soil respiration does occur inside the collars after 60 days and the heterotrophic component of soil respiration accounts for 84% of total soil respiration.

KEYWORDS: microbial respiration, root respiration, steady state, soil CO₂ ratio, flux rate