BELOWGROUND CARBON ALLOCATION IN TERRESTRIAL ECOSYSTEMS

A McIntire-Stennis supported project

TEXAS A&M UNIVERSITY

Belowground carbon dynamics remain a significant uncertainty in ecosystem models. The interannual dynamics of carbon fluxes, and responses to extreme weather events and disturbances require realistic representation of carbon allocation to different plant compartments, and their subsequent entry to and processing in the soil. Given that allocation is difficult to measure directly with existing tools, indirect approaches have been used to estimate the plant allocation patterns. In addition to the difficulty of quantifying changes in belowground carbon pools (due to their high spatial variability), difficulty of isolating the highly dynamic fine roots, and the variable allocation to and use from the storage carbohydrate pool further complicate the assessment of plant carbon allocation. We use a flux-based framework that partitions photosynthetically assimilated and storage-derived carbon to above- and belowground pools, using directly or indirectly estimable fluxes of net primary production, gross primary production, and total and root-free soil CO_2 efflux.

About McIntire-Stennis

The McIntire-Stennis program, a unique federal-state partnership, cultivates and delivers forestry and natural resource innovations for a better future. By advancing research and education that increases the understanding of emerging challenges and fosters the development of relevant solutions, the McIntire-Stennis program has ensured healthy resilient forests and communities and an exceptional natural resources workforce since 1962.

USDA

COLLABORATION

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Highlight

Demonstrated the role of photosynthetic carbon supply as the main source of diurnal variability in soil CO_2 and CH_4 production.

IMPACT

Improved understanding of the controls of carbon dynamics in ecosystems, with implications for global carbon cycle modeling.

Soil CO_2 Production

depends on carbohydrate supply on diurnal scale, temperature on weekly and synoptic scales, and moisture on seasonal scale.

Sea-level rise

and hydrology affect the viability of predominant species and the carbon sequestration potential of ecosystems.

Soil C decay

responds to altered microbial composition and soil enzyme activities under sea-level rise and altered hydrology.