Title: **Pervasive shifts in forest dynamics in a changing world**

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Project Abstract: Forest dynamics arise from the interplay of chronic drivers and transient disturbances with the demographic processes of recruitment, growth, and mortality. The resulting trajectories of vegetation development drive the biomass and species composition of terrestrial ecosystems. Forest dynamics are changing due to anthropogenic-driven exacerbation of chronic drivers, such as rising temperature and CO_2, and increasing transient disturbances, including wildfire, drought, windthrow, biotic attack, and land-use change. There are widespread observations of increasing tree mortality due to changing climate and land use, accompanied by observations of growth stimulation of younger forests due to CO_2 fertilization. These antagonistic processes are co-occurring globally, leaving the fate of future forests uncertain.

We examine the implications of changing forest demography and its drivers as a critical uncertainty for both future forest management and forecasting impacts of global climate forcing. Ongoing changes in environmental drivers and disturbance regimes are consistently increasing mortality and forcing forests towards shorter and younger stands, reducing potential carbon storage. Acclimation, adaptation, and migration may partially mitigate these effects. These increased forest impacts are due to natural disturbances (e.g. wildfire, drought, windthrow, insect/pathogen outbreaks) and land-use change, both of which are predicted to increase in magnitude in the future. Tree growth, and potentially recruitment, may have increased globally in the 20th century based on atmospherically derived estimates of the terrestrial carbon sink and based on remote sensing data, but the growth of this carbon sink has slowed. Variability in growth stimulation due to CO_2 fertilization is evident globally, with observations and experiments suggesting that forests benefit from CO_2 primarily in early stages of secondary succession. Furthermore, increased tree growth typically requires sufficient water and nutrients to take advantage of rising CO_2. Collectively, the evidence reveals that it is highly likely that tree mortality rates will continue to increase while recruitment and growth will respond to changing drivers in a spatially and temporally variable manner. The net impact will be a reduction in forest canopy cover and