

Title: Simulating Environmentally Sensitive Tree Recruitment in Vegetation Demographic Models

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Project Abstract:

Vegetation demographic models (VDMs) endeavor to predict how global forests will respond to climate change. This requires simulating which trees, if any, are able to recruit under changing environmental conditions. We present a new recruitment scheme for VDMs in which functional-type-specific recruitment rates are sensitive to light, soil moisture, and the productivity of reproductive trees. We evaluate the scheme by predicting tree recruitment for four tropical tree functional types under varying meteorology and canopy structure at Barro Colorado Island, Panama. We compare predictions to those of a current VDM, quantitative observations, and ecological expectations. We find that the scheme improves the magnitude and rank order of recruitment rates among functional types and captures recruitment limitations in response to variable understory light, soil moisture, and changing precipitation regimes. Our results indicate that adopting this framework will improve VDM capacity to predict functional-type-specific tree recruitment in response to climate change, thereby improving predictions of future forest distribution, composition, and function.