

Supplementary materials belonging to the article:

When trees don't act their age: size-deterministic tree-ring standardization for long-term trend estimation in shade tolerant trees

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Supplement S1 – SORTIE-ND simulation parameters

For the sugar maple simulation, initial stand densities were estimated from an intensively sampled maple dominated stand in Northern Ontario (Toobee Lake, Table 1). Standard model parameters were used (Pacala 1996, Pacala 1993) with one exception, annual adult stochastic mortality was raised to 0.015 (from 0.010) as it has been suggested that old-growth maple stands exhibit higher adult mortality than suggested by the SORTIE model (Lorimer et al. 2001). The model was run for 1000 years, ensuring a stable age distribution was achieved. This suggested minimal net change in biomass across the stand and ensured no underlying long-term growth-trend was present in the raw tree-ring data. For the white pine simulation, the stand was 100% white pine, standard model parameters were used, and the simulation was run for 1000 years. All living trees (>5 cm dbh), (n=3657 sugar maple), (n=7362, white pine) in the final year of the model run were used for further analysis.

References :

- Lorimer, C. G., Dahir, S. E., & Nordheim, E. V. (2001). Tree mortality rates and longevity in mature and old-growth hemlock-hardwood forests. *Journal of Ecology*, 89(6), 960-971.
- Pacala, S. W., Canham, C. D., Saponara, J., Silander, J. A., Kobe, R. K., & Ribbens, E. (1996). Forest models defined by field measurements: estimation, error analysis and dynamics. *Ecological Monographs*, 66(1), 1-43.
- Pacala, S. W., Canham, C. D., & Silander Jr, J. A. (1993). Forest models defined by field measurements: I. The design of a northeastern forest simulator. *Canadian Journal of Forest Research*, 23(10), 1980-1988.

Supplement S2 – Sampling methods

Stands were considered suitable for this study given that they were multi-cohort, self-replacing, pure maple stands (<5% composition of other species). Within stands all trees >5cm dbh were sampled in three 7-meter radius plots. Tree cores were collected at a height of 1.3m from all sampled trees; with large trees cored twice and smaller trees destroyed, and cross sections removed from the site (in permitting locations). This method improves accuracy of ring measurements and increases the likelihood of sampling the pith, and thus proper age estimation. Tree cores were mounted, sanded, and measured using WinDENDRO™ image analysis. Cores were cross-dated visually and checked graphically and statistically, using the dplR program in R.

Figure S2 – Sugar maple and red spruce tree ring chronologies produced by five standardization models. Chronologies compiled from annual robust mean of model residuals. COMB.red/SDS.red indicate models applied to a reduced dataset consisting only of aged trees.







