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Jeremy W. Lichstein, Jonathan Dushoff, Kiona Ogle, Anping Chen, Drew W. Purves, John P. Caspersen, and Stephen W. Pacala. 2009. Unlocking the forest inventory data: relating individual-tree performance to unmeasured environmental factors. *Ecological Applications* VOL:pp–pp.

Appendix D. Growth data: sampling protocol and growth measurements.

We targeted saplings of nine common species at our field sites for annual dbh growth (G) data. The 579 growth saplings were a systematic subsample of the 2128 focal saplings used in the light-model analysis: every k^{th} focal sapling belonging to a target species was sampled, where k ranged from 1-5 depending on the density of a given target species in a stand.

For 89 saplings, G was estimated from stem cross-sections ('discs') collected at breast and/or 10-cm heights. For 531 saplings, G was estimated from increment cores. Both discs and cores were available for 41 saplings. Cores were extracted with an increment hammer or an increment borer at 10-cm height for saplings with dbh < 4 cm, and at both breast and 10-cm heights otherwise. Cores and discs were sanded with progressively finer sand paper until annual rings could be resolved with a dissecting microscope. Ring widths were measured with an optical micrometer to a resolution of 0.025-0.1 mm, with finer resolution used for narrower rings. Disc ring widths were measured along each of four perpendicular radii and averaged. For both cores and discs, the widths of the two most recent complete rings (excluding the incomplete ring of the current year) were averaged and then doubled to yield annual diameter growth. To correct for shrinkage, this value was multiplied by 1.06 (the empirical ratio of wet to dry disc diameters, averaged across species) to obtain G. We did not account for bark growth.

We performed several simple analyses to determine the consistency (for the same sapling) of estimates of G obtained from cores vs. discs, or from samples at breast vs. 10-cm heights. We used major axis (MA) regression (a form of 'Model II' regression), to determine the slopes of these relationships. Model II regression is appropriate when both variables are subject to error. MA is an appropriate form of Model II regression when both variables are expressed in the same units (Legendre and Legendre 1998). The MA slope for cores vs. discs (n = 41) was 1.12, and the correlation was 0.97. The MA slope for breast vs. 10-cm height (n = 335: 87 from discs, 358 from cores) was 0.91, and the correlation was 0.94. After removing eight outliers, the MA slope for breast vs. 10-cm height was 0.98, and the correlation was 0.95. These results imply that all of the estimates of G are consistent with each other.

Based on the above results, and on our greater *a priori* confidence in growth rates estimated from discs than cores, we adopted the following protocol for assigning G: If a breast-height disc was available, it alone was used. Otherwise, if a 10-cm height disc was available, it alone was used. Otherwise, if both breast and 10-cm height cores were available, ring widths from the two were averaged. Otherwise, whichever core was available was used alone.

References for Appendix D

Legendre, P., and L. Legendre. 1998. Numerical ecology, second English edition. Elsevier Science, Amsterdam, The Netherlands.