## LITERATURE CITED

Anderegg, WRL, C Schwalm, F Biondi, JJ Camarero, G Koch, M Litvak, K Ogle, JD Shaw, et al. 2015. Pervasive drought legacies in forest ecosystems and their implications for carbon cycle models. *Science*, 349:528-532.

Bawa, KS. 1990. Plant-pollinator interactions in tropical rain forests. *Annual Review of Ecology and Systematics*, 21:399-422.

Berry, F & WJ Kress. 1991. *Heliconia: an identification guide.* Smithsonian Institution Press, Washington D.C., USA

Bierregaard, RO, C Gascon, TE Lovejoy & R Mesquita. 2001. Lessons from Amazonia: the ecology and conservation of a fragmented forest. pp. 478. Yale University Press, New Haven.

Blake, JG & BA Loiselle. 1992. Fruits in the diets of Neotropical migrant birds in Costa Rica. *Biotropica*, 24:200-210.

Bolker, BM, ME Brooks, CJ Clark, SW Geange, JR Poulsen, MHH Stevens & JSS White. 2009. Generalized linear mixed models: a practical guide for ecology and evolution. *Trends in Ecology & Evolution*, 24:127-135.

Boyce, MS, CV Haridas & CT Lee. 2006. Demography in an increasingly variable world. *Trends in Ecology & Evolution*, 21:141-148.

Broadbent, EN, GP Asner, M Keller, DE Knapp, PJC Oliveira & JN Silva. 2008. Forest fragmentation and edge effects from deforestation and selective logging in the Brazilian Amazon. *Biological Conservation*, 141:1745-1757.

Brodie, J, E Post & WF Laurance. 2012. Climate change and tropical biodiversity: a new focus. *Trends in Ecology & Evolution*, 27:145-150.

Brooks, ME, K Kristensen, MR Darrigo, P Rubim, M Uriarte, E Bruna & BM Bolker. 2019. Statistical modeling of patterns in annual reproductive rates. *Ecology*, 100.

Brudvig, LA, SJ Leroux, CH Albert, EM Bruna, KF Davies, RM Ewers, DJ Levey, R Pardini & J Resasco. 2017. Evaluating conceptual models of landscape change. *Ecography*, 40:74-84.

Bruna, EM. 1999. Seed germination in rainforest fragments. *Nature*, 402:139.

Bruna, EM. 2002. Effects of forest fragmentation on *Heliconia acuminata* seedling recruitment in central Amazonia. *Oecologia*, 132:235-243.

Bruna, EM. 2003. Are plants in rain forest fragments recruitment limited? Tests with an Amazonian herb. *Ecology*, 84:932-947.

Bruna, EM. 2010. Scientific journals can advance tropical biology and conservation by requiring data archiving. *Biotropica*, 42:399-401.

Bruna, EM. 2014. R code for analyses and in Bruna et al. Effect of mutualist partner identity on plant demography, v 1.0 http://dx.doi.org/10.5281/zenodo.11650.

Bruna, EM & AS de Andrade. 2011. Edge effects on growth and biomass partitioning of an Amazonian understory herb (*Heliconia acuminata*; Heliconiaceae). *American Journal of Botany*, 98:1727-1734.

Bruna, EM, IJ Fiske & MD Trager. 2009. Habitat fragmentation and plant populations: is what we know demographically irrelevant? *Journal of Vegetation Science*, 20:569-576.

Bruna, EM, TJ Izzo, BD Inouye & HL Vasconcelos. 2014. Effect of mutualist partner identity on plant demography. *Ecology*, 95:3237-3243.

Bruna, EM & WJ Kress. 2002. Habitat fragmentation and the demographic structure of an Amazonian understory herb (*Heliconia acuminata*). *Conservation Biology*, 16:1256-1266.

Bruna, EM, WJ Kress, OF da Silva & F Marques. 2004. *Heliconia acuminata* reproductive succeess is independent of local flowering plant density. *Acta Amazonica*, 34:467-471.

Bruna, EM, O Nardy, SY Strauss & SP Harrison. 2002. Experimental assessment of *Heliconia acuminata* growth in a fragmented Amazonian landscape. *Journal of Ecology*, 90:639-649.

Bruna, EM & MB Nogueira Ribeiro. 2005. Regeneration and population structure of *Heliconia acuminata* in Amazonian secondary forests with contrasting land-use histories. *Journal of Tropical Ecology*, 21:127-131.

Bruna, EM & MK Oli. 2005. Demographic consequences of habitat fragmentation for an Amazonian understory plant: analysis of life-table response experiments. *Ecology*, 86:1816-1824.

Caswell, H. 1989. Analysis of life table response experiments 1: Decomposition of effects on population growth rate. *Ecological Modelling*, 46:221-237.

Caswell, H. 2001. *Matrix population models: construction, analysis, and interpretation.* Sinauer Associates, Sunderland

Childs, DZ, TN Coulson, JM Pemberton, TH Clutton-Brock & M Rees. 2011. Predicting trait values and measuring selection in complex life histories: reproductive allocation decisions in Soay sheep. *Ecology Letters*, 14:985-992.

Condit, R, S Aguilar, A Hernandez, R Perez, S Lao, G Angehr, SP Hubbell & RB Foster. 2004. Tropical forest dynamics across a rainfall gradient and the impact of an El Nino dry season. *Journal of Tropical Ecology*, 20:51-72.

Connell, JH & PT Green. 2000. Seedling dynamics over thirty-two years in a tropical rain forest tree. *Ecology*, 81:568-584.

Corlett, RT. 2011. Impacts of warming on tropical lowland rainforests. *Trends in Ecology & Evolution*, 26:606-613.

Cortes, M, M Uriarte, M Lemes, R Gribel, WJ Kress, PE Smouse & EM Bruna. 2013. Low plant density enhances gene dispersal in the Amazonian understory herb *Heliconia acuminata*. *Molecular Ecology*, 22:5716-5729.

Crone, EE, ES Menges, MM Ellis, T Bell, P Bierzychudek, J Ehrlen, TN Kaye, TM Knight, *et al.* 2011. How do plant ecologists use matrix population models? *Ecology Letters*, 14:1-8.

Curran, LM & M Leighton. 2000. Vertebrate responses to spatiotemporal variation in seed production of mast-fruiting Dipterocarpaceae. *Ecological Monographs.*, 70:101-128.

Dalgleish, HJ, DN Koons, MB Hooten, CA Moffet & PB Adler. 2011. Climate influences the demography of three dominant sagebrush steppe plants. *Ecology*, 92:75-85.

Delissio, LJ & RB Primack. 2003. The impact of drought on the population dynamics of canopy-tree seedlings in an aseasonal Malaysian rain forest. *Journal of Tropical Ecology*, 19:489-500.

Didham, RK, V Kapos & RM Ewers. 2012. Rethinking the conceptual foundations of habitat fragmentation research. *Oikos*, 121:161-170.

Doak, DF & WF Morris. 2010. Demographic compensation and tipping points in climate-induced range shifts. *Nature*, 467:959-962.

Driscoll, DA, SC Banks, PS Barton, DB Lindenmayer & AL Smith. 2013. Conceptual domain of the matrix in fragmented landscapes. *Trends in Ecology & Evolution*, 28:605-613.

Duffy, PB, P Brando, GP Asner & CB Field. 2015. Projections of future meteorological drought and wet periods in the Amazon. *Proceedings of the National Academy of Sciences of the United States of America*, 112:13172-13177.

Easterling, MR, SP Ellner & PM Dixon. 2000. Size-specific sensitivity: Applying a new structured population model. *Ecology*, 81:694-708.

Edwards, W & A Krockenberger. 2006. Seedling mortality due to drought and fire associated with the 2002 El Nino event in a tropical rain forest in north-east Queensland, Australia. *Biotropica*, 38:16-26.

Ehrlen, J & WF Morris. 2015. Predicting changes in the distribution and abundance of species under environmental change. *Ecology Letters*, 18:303-314.

Ehrlen, J, WF Morris, T von Euler & JP Dahlgren. 2016. Advancing environmentally explicit structured population models of plants. *Journal of Ecology*, 104:292-305.

Ellner, SP, DZ Childs & M Rees. 2016. Data-driven modelling of structured populations. *A practical guide to the Integral Projection Model. Cham: Springer.* 

Ellner, SP & M Rees. 2006. Integral projection models for species with complex demography. *American Naturalist*, 167:410-428.

Engelbrecht, BMJ, SJ Wright & D De Steven. 2002. Survival and ecophysiology of tree seedlings during El Nino drought in a tropical moist forest in Panama. *Journal of Tropical Ecology*, 18:569-579.

Eyring, V, S Bony, GA Meehl, CA Senior, B Stevens, RJ Stouffer & KE Taylor. 2016. Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization. *Geoscientific Model Development*, 9:1937-1958.

Feldpausch, TR, OL Phillips, RJW Brienen, E Gloor, J Lloyd, G Lopez-Gonzalez, A Monteagudo-Mendoza, Y Malhi, *et al.* 2016. Amazon forest response to repeated droughts. *Global Biogeochemical Cycles*, 30:964-982.

Fiske, IJ & EM Bruna. 2010. Alternative spatial sampling in studies of plant demography: consequences for estimates of population growth rate. *Plant Ecology*, 207:213-225.

Fiske, IJ, EM Bruna & BM Bolker. 2008. Effects of sample size on estimates of population growth rates calculated with matrix models. *PLoS One*, 3:e3080.

Fletcher, RJ, RK Didham, C Banks-Leite, J Barlow, RM Ewers, J Rosindell, RD Holt, A Gonzalez, *et al.* 2018. Is habitat fragmentation good for biodiversity? *Biological Conservation*, 226:9-15.

Gagnon, PR, EM Bruna, P Rubim, MR Darrigo, RC Littell, M Uriarte & WJ Kress. 2011. Growth of an understory herb is chronically reduced in Amazonian forest fragments. *Biological Conservation*, 144:830-835.

Gentry, AH & C Dodson. 1987. Contribution of nontrees to species richness of a tropical rain forest. *Biotropica*:149-156.

Gentry, AH & LH Emmons. 1987. Geographical variation in fertility, phenology and composition of the understory of neotropical forests. *Biotropica*, 19:216-217.

Gilbert, GS, KE Harms, DN Hammill & SP Hubbell. 2001. Effects of seedling size, El Niño drought, seedling density, and distance to nearest conspecific adult on 6-year survival of *Ocotea whitei* seedlings in Panamá. *Oecologia*, 127:509-516.

Guan, BT, WE Wright, C-H Chung & S-T Chang. 2012. ENSO and PDO strongly influence Taiwan spruce height growth. *Forest Ecology and Management*, 267:50-57.

Haddad, NM, LA Brudvig, J Clobert, KF Davies, A Gonzalez, RD Holt, TE Lovejoy, JO Sexton, et al. 2015. Habitat fragmentation and its lasting impact on Earth's ecosystems. Science Advances, 1.

Harris, LD. 1984. *The Fragmented Forest: Island Biogeography Theory and the Preservation of Biotic Diversity.* University of Chicago Press, Chicago

Harrison, S & E Bruna. 1999. Habitat fragmentation and large-scale conservation: what do we know for sure? *Ecography*, 22:225-232.

Horvitz, CC & DW Schemske. 1995. Spatiotemporal variation in demographic transitions of a tropical understory herb: Projection matrix analysis. *Ecological Monographs*, 65:155-192.

Howe, HF & J Smallwood. 1982. Ecology of seed dispersal. *Annual Review of Ecology and Systematics*, 13:201-228.

Jevanandam, N, AGR Goh & RT Corlett. 2013. Climate warming and the potential extinction of fig wasps, the obligate pollinators of figs. *Biology Letters*, 9:20130041.

Kress, J. 1990. The diversity and distribution of *Heliconia* (Heliconiaceae) in Brazil. *Acta Botanica Brasileira*, 4:159-167.

Kress, WJ. 1983. Self-incompatibility systems in Central American *Heliconia*. *Evolution*, 37:735-744.

Kress, WJ & JH Beach. 1994. Flowering plant reproductive systems. *La Selva: ecology and natural history of a neotropical rain forest*, 19:33.

Laurance, WF, AS Andrade, A Magrach, JLC Camargo, M Campbell, PM Fearnside, W Edwards, JJ Valsko, TE Lovejoy & SG Laurance. 2014. Apparent environmental synergism drives the dynamics of Amazonian forest fragments. *Ecology*, 95:3018-3026.

Laurance, WF, JLC Camargo, RCC Luizao, SG Laurance, SL Pimm, EM Bruna, PC Stouffer, GB Williamson, *et al.* 2011. The fate of Amazonian forest fragments: A 32-year investigation. *Biological Conservation*. 144:56-67.

Laurance, WF, LV Ferreira, JM Rankin de Merona & SG Laurance. 1998. Rain forest fragmentation and the dynamics of Amazonian tree communities. *Ecology*, 79:2032-2040.

Laurance, WF & GB Williamson. 2001. Positive feedbacks among forest fragmentation, drought, and climate change in the Amazon. *Conservation Biology*, 15:1529-1535.

Laurance, WF, GB Williamson, P Delamonica, A Oliveira, TE Lovejoy, C Gascon & L Pohl. 2001. Effects of a strong drought on Amazonian forest fragments and edges. *Journal of Tropical Ecology*, 17:771-785.

Lewis, SL, PM Brando, OL Phillips, GMF van der Heijden & D Nepstad. 2011. The 2010 Amazon Drought. *Science*, 331:554-554.

Li, W, P Zhang, J Ye, L Li & PA Baker. 2010. Impact of two different types of El Niño events on the Amazon climate and ecosystem productivity. *Journal of Plant Ecology*, 4:91-99.

Linhart, YB. 1973. Ecological and behavioral determinants of pollen dispersal in hummingbird pollinated *Heliconia*. *American Naturalist*, 107:511-523.

Maldonado-Chaparro, AA, DT Blumstein, KB Armitage & DZ Childs. 2018. Transient LTRE analysis reveals the demographic and trait-mediated processes that buffer population growth. *Ecology Letters*, 21:1693-1703.

Malhi, Y & J Wright. 2004. Spatial patterns and recent trends in the climate of tropical rainforest regions. *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences*, 359:311-329.

Mandle, L, T Ticktin & PA Zuidema. 2015. Resilience of palm populations to disturbance is determined by interactive effects of fire, herbivory and harvest. *Journal of Ecology,* 103:1032-1043.

Martinez-Ramos, M, NPR Anten & DD Ackerly. 2009. Defoliation and ENSO effects on vital rates of an understorey tropical rain forest palm. *Journal of Ecology*, 97:1050-1061.

Maza-Villalobos, S, L Poorter & M Martinez-Ramos. 2013. Effects of ENSO and temporal rainfall variation on the dynamics of successional communities in old-field succession of a tropical dry forest. *Plos One*, 8:e82040.

McKee, TB, NJ Doesken & J Kleist. 1993. The Relationship of Drought Frequency and Duration to Time Scales. 8th Conference on Applied Climatology, pp. 179–184. Anaheim, California.

McLean, MW, G Hooker, AM Staicu, F Scheipl & D Ruppert. 2014. Functional Generalized Additive Models. *Journal of Computational and Graphical Statistics*, 23:249-269.

Meir, P, PM Brando, D Nepstad, S Vasconcelos, A Costa, E Davidson, S Almeida, RA Fisher, E Sotta & D Zarin. 2009. The effects of drought on Amazonian rain forests. *Amazonia and Global Change (Geophysical Monograph Series)*, 186:429-449.

Meir, P & FI Woodward. 2010. Amazonian rain forests and drought: response and vulnerability. *New Phytologist*, 187:553-557.

Merow, C, JP Dahlgren, CJE Metcalf, DZ Childs, MEK Evans, E Jongejans, S Record, M Rees, R Salguero-Gómez & SM McMahon. 2014. Advancing population ecology with integral projection models: a practical guide. *Methods in Ecology and Evolution*, 5:99–110.

Metcalf, CJE, SP Ellner, DZ Childs, R Salguero-Gomez, C Merow, SM McMahon, E Jongejans & M Rees. 2015. Statistical modelling of annual variation for inference on stochastic population dynamics using Integral Projection Models. *Methods in Ecology and Evolution*, 6:1007-1017.

Metcalf, CJE, SM McMahon, R Salguero-Gomez & E Jongejans. 2013. IPMpack: an R package for integral projection models. *Methods in Ecology and Evolution*, 4:195-200.

Molowny-Horas, R, ML Suarez & F Lloret. 2017. Changes in the natural dynamics of *Nothofagus dombeyi* forests: population modeling with increasing drought frequencies. *Ecosphere*. 8:1-17.

Mora, C, AG Frazier, RJ Longman, RS Dacks, MM Walton, EJ Tong, JJ Sanchez, LR Kaiser, et al. 2013. The projected timing of climate departure from recent variability. *Nature*, 502:183-187

Morris, WF & DF Doak. 2002. Quantitative conservation biology: theory and practice of population viability analysis. Sinauer, Sunderland, MA

Morris, WF, CA Pfister, S Tuljapurkar, CV Haridas, CL Boggs, MS Boyce, EM Bruna, DR Church, *et al.* 2008. Longevity can buffer plant and animal populations against changing climatic variability. *Ecology*, 89:19-25.

National Weather Service. 2014. Historical El Nino/La Nina episodes (1950-present). Issued by the NWS Climate Prediction Center.

https://origin.cpc.ncep.noaa.gov/products/analysis monitoring/ensostuff/ONI v5.php

National Weather Service. 2015. El Niño Southern Oscillation (ENSO) diagnostic discussion. Issued by the NWS Climate Prediction Center and the International Research Institute for Climate and Society (9 July 2015).

http://www.cpc.ncep.noaa.gov/products/analysis monitoring/enso advisory/ensodisc.html

Nicole, F, JP Dahlgren, A Vivat, I Till-Bottraud & J Ehrlen. 2011. Interdependent effects of habitat quality and climate on population growth of an endangered plant. *Journal of Ecology*, 99:1211-1218.

Ogle, K, JJ Barber, GA Barron-Gafford, LP Bentley, JM Young, TE Huxman, ME Loik & DT Tissue. 2015. Quantifying ecological memory in plant and ecosystem processes. *Ecology Letters*, 18:221-235.

Opdam, P & D Wascher. 2004. Climate change meets habitat fragmentation: linking landscape and biogeographical scale levels in research and conservation. *Biological Conservation*, 117:285-297.

Pan, YD, RA Birdsey, JY Fang, R Houghton, PE Kauppi, WA Kurz, OL Phillips, A Shvidenko, *et al.* 2011. A large and persistent carbon sink in the world's forests. *Science*, 333:988-993.

Pau, S, EM Wolkovich, BI Cook, CJ Nytch, J Regetz, JK Zimmerman & SJ Wright. 2013. Clouds and temperature drive dynamic changes in tropical flower production. *Nature Climate Change*, 3:838-842.

Phillips, OL, G van der Heijden, SL Lewis, G López-González, LEOC Aragão, J Lloyd, Y Malhi, A Monteagudo, *et al.* 2010. Drought–mortality relationships for tropical forests. *New Phytologist*, 187:631-646.

Poder Executivo Federal. 1985. Decreto No. 91.884 de 5 de novembro de 1985. Declara como Área de Relevante Interesse Ecológico - ARIE as porções de terras de vários ecossistemas que integram o Projeto Dinâmica Biológica de Fragmentos Florestais, localizada no Estado do Amazonas, e dá outras providências. Diário Oficial, Brasília, DF, 6 nov. 1985. Seção 1, p. 7.

Powell, LL, PC Stouffer & El Johnson. 2013. Recovery of Understory Bird Movement across the Interface of Primary and Secondary Amazon Rainforest. *Auk.* 130:459-468.

R Core Team. 2018. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.

Rees, M & SP Ellner. 2009. Integral projection models for populations in temporally varying environments. *Ecological Monographs*, 79:575-594.

Resasco, J, EM Bruna, NM Haddad, C Banks-Leite & CR Margules. 2017. The contribution of theory and experiments to conservation in fragmented landscapes. *Ecography*, 40:109-118.

Ribeiro, MBN, EM Bruna & W Mantovani. 2010. Influence of post-clearing treatment on the recovery of herbaceous plant communities in amazonian secondary forests. *Restoration Ecology*, 18:50-58.

Salguero-Gomez, R, OR Jones, CR Archer, YM Buckley, J Che-Castaldo, H Caswell, D Hodgson, A Scheuerlein, *et al.* 2015. The COMPADRE Plant Matrix Database: an open online repository for plant demography. *Journal of Ecology*, 103:202-218.

Schwartz, NB, M Uriarte, VH Gutierrez-Velez, W Baethgen, R DeFries, K Fernandes & MA Pinedo-Vasquez. 2015. Climate, landowner residency, and land cover predict local scale fire

activity in the Western Amazon. *Global Environmental Change-Human and Policy Dimensions*, 31:144-153.

Seidl, R, D Thom, M Kautz, D Martin-Benito, M Peltoniemi, G Vacchiano, J Wild, D Ascoli, et al. 2017. Forest disturbances under climate change. *Nature Climate Change*, 7:395-402.

Selwood, KE, MA McGeoch & R Mac Nally. 2015. The effects of climate change and land - use change on demographic rates and population viability. *Biological Reviews*, 90:837-853.

Shackleton, CM, T Ticktin & AB Cunningham. 2018. Nontimber forest products as ecological and biocultural keystone species. *Ecology and Society*, 23.

Sletvold, N, JP Dahlgren, DI Oien, A Moen & J Ehrlen. 2013. Climate warming alters effects of management on population viability of threatened species: results from a 30-year experimental study on a rare orchid. *Global Change Biology*, 19:2729-2738.

Slik, J. 2004. El Nino droughts and their effects on tree species composition and diversity in tropical rain forests. *Oecologia*, 141:114-120.

Stiles, FG. 1992. Effects of a severe drought on the population biology of a tropical hummingbird. *Ecology*, 73:1375-1390.

Stott, I, S Townley & DJ Hodgson. 2011. A framework for studying transient dynamics of population projection matrix models. *Ecology Letters*, 14:959-970.

Stouffer, PC & RO Bierregaard. 1995. Effects of forest fragmentation on understory hummingbirds in Amazonian Brazil. *Conservation Biology*, 9:1085-1094.

Stouffer, PC, RO Bierregaard, C Strong & TE Lovejoy. 2006. Long-term landscape change and bird abundance in Amazonian rainforest fragments. *Conservation Biology*, 20:1212-1223.

Teller, BJ, PB Adler, CB Edwards, G Hooker & SP Ellner. 2016. Linking demography with drivers: climate and competition. *Methods in Ecology and Evolution*, 7:171-183.

Tenhumberg, B, EE Crone, S Ramula & AJ Tyre. 2018. Time-lagged effects of weather on plant demography: drought and Astragalus scaphoides. *Ecology*, 99:915-925.

Tye, MR, ES Menges, C Weekley, PF Quintana-Ascencio & R Salguero-Gomez. 2016. A demographic menage a trois: interactions between disturbances both amplify and dampen population dynamics of an endemic plant. *Journal of Ecology*, 104:1778-1788.

Uriarte, M, M Anciaes, MTB da Silva, P Rubim, E Johnson & EM Bruna. 2011. Disentangling the drivers of reduced long-distance seed dispersal by birds in an experimentally fragmented landscape. *Ecology*, 92:924-937.

Uriarte, M, EM Bruna, P Rubim, M Anciaes & I Jonckheere. 2010. Effects of forest fragmentation on the seedling recruitment of a tropical herb: assessing seed vs. safe-site limitation. *Ecology*, 91:1317-1328.

Uriarte, M, CD Canham, J Thompson & JK Zimmerman. 2004. A maximum liklihood, spatially-explicit analysis of tree growth and survival in a hurricane driven tropical forest. *Ecological Monographs*, 71:591-614.

Uriarte, M, CD Canham, J Thompson & JK Zimmerman. 2005. Seedling recruitment in a hurricane-driven tropical forest: light limitation, density dependence, and the spatial distribution of parent trees. *Journal of Ecology*, 93:291-304.

Uriarte, M, JR Lasky, VK Boukili & RL Chazdon. 2016a. A trait-mediated, neighbourhood approach to quantify climate impacts on successional dynamics of tropical rainforests. *Functional Ecology*, 30:157-167.

Uriarte, M, N Schwartz, JS Powers, E Marín-Spiotta, W Liao & LK Werden. 2016b. Impacts of climate variability on tree demography in second growth tropical forests: the importance of regional context for predicting successional trajectories. *Biotropica*, 48:780-797.

van de Pol, M, LD Bailey, N McLean, L Rijsdijk, CR Lawson & L Brouwer. 2016. Identifying the best climatic predictors in ecology and evolution. *Methods in Ecology and Evolution*, 7:1246-1257.

Wilcove, DS, CH McLellan & AP Dobson. 1986. Habitat fragmentation in the temperate zone. *Conservation biology: The science of scarcity and diversity.* (ed M. E. Soulé), pp. 237–256. Sinauer Associates, Sunderland.

Williams, JL, H Jacquemyn, BM Ochocki, R Brys & TEX Miller. 2015. Lifehistory evolution under climate change and its influence on the population dynamics of a long-lived plant. *Journal of Ecology*, 103:798-808.

Williamson, GB, WF Laurance, AA Oliveira, P Delamonica, C Gascon, TE Lovejoy & L Pohl. 2000. Amazonian tree mortality during the 1997 El Nino drought. *Conservation Biology*, 14:1538-1542.

Wright, SJ & O Calderon. 2006. Seasonal, El Nino and longer term changes in flower and seed production in a moist tropical forest. *Ecology Letters*, 9:35-44.

Wright, SJ, C Carrasco, O Calderon & S Paton. 1999. The El Nino Southern Oscillation variable fruit production, and famine in a tropical forest. *Ecology*, 80:1632-1647.

Wright, SJ, HC Muller-Landau, O Calderon & A Hernandez. 2005. Annual and spatial variation in seedfall and seedling recruitment in a neotropical forest. *Ecology*, 86:848-860.

Wu, Z & NE Huang. 2009. Ensemble empirical mode decomposition: a noise-assisted data analysis method. *Advances in Adaptive Data Analysis*, 1:1-41.

Zartman, CE, JA Amaral, JN Figueiredo & CD Dambros. 2015. Drought impacts survivorship and reproductive strategies of an epiphyllous leafy liverwort in central Amazonia. *Biotropica*, 47:172-178.

Zeng, N, JH Yoon, JA Marengo, A Subramaniam, CA Nobre, A Mariotti & JD Neelin. 2008. Causes and impacts of the 2005 Amazon drought. *Environmental Research Letters*, 3:1-9.