

Supplementary Materials: Forest Fragmentation in the Lower Amazon Floodplain: Implications for Biodiversity and Ecosystem Service Provision to Riverine Populations

Vivian Renó, Evlyn Novo and Maria Escada

Table S1. Studies reviewed in Section 3.2.

Author (Reference)	Location	Biome
TREES		
Benchimol and Peres 2015 [1]	Amazon upland forest—Brazil	Tropical
Kapos et al., 1993 [2]	Amazon upland forest—Brazil	Tropical
Laurance et al., 1998 [3]	Amazon upland forest—Brazil	Tropical
Laurance et al., 2002 [4]	Amazon upland forest—Brazil	Tropical
Metzger 2000 [5]	Atlantic forest—Brazil	Tropical
Michalski et al., 2007 [6]	Amazon upland forest—Brazil	Tropical
Santos et al., 2014 [7]	Amazon upland forest—Brazil	Tropical
Birds		
Laurance et al., 2002 [4]	Amazon upland forest—Brazil	Tropical
Lees and Peres 2008a [8]	Amazon upland forest—Brazil	Tropical
Lees and Peres 2009 [9]	Amazon upland forest—Brazil	Tropical
Lovejoy et al., 1986 [10]	Amazon upland forest—Brazil	Tropical
Stouffer and Bierregaard 1995a [11]	Amazon upland forest—Brazil	Tropical
Stouffer and Bierregaard 1995b [12]	Amazon upland forest—Brazil	Tropical
Stratford and Stouffer 1999 [13]	Amazon upland forest—Brazil	Tropical
Stratford and Stouffer 2015 [14]	Amazon upland forest—Brazil	Tropical
Mammals		
Lees and Peres 2008b [15]	Amazon upland forest—Brazil	Tropical
Lovejoy et al., 1986 [10]	Amazon upland forest—Brazil	Tropical
Lyra-Jorge et al., 2009 [16]	Atlantic forest and savanna—Brazil	Tropical
Michalski and Peres 2007 [17]	Amazon upland forest—Brazil	Tropical
Santos-Filho et al., 2012 [18]	Amazon upland forest—Brazil	Tropical
Stevens and Husband 1998 [19]	Atlantic forest—Brazil	Tropical
Bianchi et al., 2006 [20]	Agroecosystems and non-crop habitats—North America and Europe	Temperate
Brosi et al., 2007 [21]	Forest-agriculture landscape (Costa Rica)	Tropical
Brown and Albrecht 2001 [22]	Amazon upland forest and savanna —Brazil	Tropical
Brown 1997 [23]	Amazon upland forest—Brazil	Tropical
Carvalho and Vasconcelos 1999 [24]	Amazon upland forest—Brazil	Tropical
Didham et al., 1996 [25]	Amazon upland forest—Brazil	Tropical
Dohm et al., 2011 [26]	Amazon upland forest—Brazil	Tropical
Guimarães et al., 2014 [27]	Forest and non-forest ecosystems around the world	Tropical and temperate
Hadley and Betts 2011 [28]	Forest and crops (North America and Europe)	Temperate
Kruess and Tscharntke 1994 [29]	Meadow-agriculture landscape (Germany)	Temperate
Kruess and Tscharntke 2000 [30]	Meadow-agriculture landscape (Germany)	Temperate
Laurance et al., 2002 [4]	Amazon upland forest—Brazil	Tropical
Lovejoy et al., 1986 [10]	Amazon upland forest—Brazil	Tropical
Powel and Powel 1987 [31]	Amazon upland forest—Brazil	Tropical
Ricketts et al., 2008 [32]	Forest-agriculture landscapes around the world	Tropical and temperate
Ricketts et al., 2006 [33]	Forest-agriculture landscape (Costa Rica)	Tropical
Urbas et al., 2007 [34]	Atlantic forest—Brazil	Tropical

References

1. Benchimol, M.; Peres, C.A. Edge-mediated compositional and functional decay of tree assemblages in Amazonian forest islands after 26 years of isolation. *J. Ecol.* **2015**, *103*, 408–420.
2. Kapos, V.; Ganade, G.; Matsui, E.; Victoria, R.L. $\delta^{13}\text{C}$ as an indicator of edge effects in tropical rainforest reserves. *J. Ecol.* **1993**, *81*, 425–432.
3. Laurance, W.F.; Ferreira, L.V.; Rankin-de Merona, J.M.; Laurance, S.G. Rain forest fragmentation and the dynamics of Amazonian tree communities. *Ecology* **1998**, *79*, 2032–2040.

4. Laurance, W.F.; Lovejoy, T.E.; Vasconcelos, H.L.; Bruna, E.M.; Didham, R.K.; Stouffer, P.C.; Gascon, C.; Bierregaard, R.O.; Laurance, S.G.; Sampaio, E. Ecosystem decay of Amazonian forest fragments: A 22-year investigation. *Conserv. Biol.* **2002**, *16*, 605–618.
5. Metzger, J.P. Tree functional group richness and landscape structure in a Brazilian tropical fragmented landscape. *Ecol. Appl.* **2000**, *10*, 1147–1161.
6. Michalski, F.; Nishi, I.; Peres, C.A. Disturbance-mediated drift in tree functional groups in Amazonian forest fragments. *Biotropica* **2007**, *39*, 691–701.
7. Santos, B.A.; Tabarelli, M.; Melo, F.P.L.; Camargo, L.C.; Andrade, A.; Laurance, S.G.; Laurance, W.F. Phylogenetic Impoverishment of Amazonian Tree Communities in an Experimentally Fragmented Forest Landscape. *PLoS ONE* **2014**, *9*, doi:10.1371/journal.pone.0113109.
8. Lees, A.C.; Peres, C.A. Avian life-history determinants of local extinction risk in a hyper-fragmented neotropical forest landscape. *Anim. Conserv.* **2008a**, *11*, 128–137.
9. Lees, A.C.; Peres, C.A. Gap-crossing movements predict species occupancy in Amazonian forest fragments. *Oikos* **2009**, *118*, 280–290.
10. Lovejoy, T.E.; Bierregaard, R.O.; Rylands, A.B.; Malcom, J.R.; Quintela, C.E.; Harper, L.H.; Brown, K.S., Jr.; Powell, A.H.; Powell, G.V.N.; Schubart, H.O.R.; et al. Edge and other Effects of Isolation on Amazon Forest Fragments. *Conserv. Biol. Sci. Scarcity Divers.* **1986**, *1*, 257–325.
11. Stouffer, P.C.; Bierregaard, R.O. Effects of Forest Fragmentation on Understory Hummingbirds in Amazonian Brazil. *Conserv. Biol.* **1995a**, *9*, 1085–1094.
12. Stouffer, P.C.; Bierregaard, R.O. Use of Amazonian Forest Fragments by Understory Insectivorous Birds. *Ecology* **1995**, *76*, 2429–2445.
13. Stratford, J.A.; Stouffer, P.C. Local extinctions of terrestrial insectivorous birds in a fragmented landscape near Manaus, Brazil. *Conserv. Biol.* **1999**, *13*, 1416–1423.
14. Stratford, J.A.; Stouffer, P.C. Forest fragmentation alters microhabitat availability for Neotropical terrestrial insectivorous birds. *Biol. Conserv.* **2015**, *188*, 109–115.
15. Lees, A.C.; Peres, C.A. Conservation value of remnant riparian forest corridors of varying quality for Amazonian birds and mammals. *Conserv. Biol.* **2008b**, *22*, 439–449.
16. Lyra-Jorge, M.C.; Ribeiro, M.C.; Ciocheti, G.; Tambosi, L.R.; Pivello, V.R. Influence of multi-scale landscape structure on the occurrence of carnivorous mammals in a human-modified savanna, Brazil. *Eur. J. Wildl. Res.* **2009**, *56*, 359–368.
17. Michalski, F.; Peres, C.A. Disturbance-Mediated Mammal Persistence and Abundance-Area Relationships in Amazonian Forest Fragments. *Conserv. Biol.* **2007**, *21*, 1626–1640.
18. Santos-Filho, M.; Peres, C.A.; Silva, D.J.; Sanaiotti, T.M. Habitat patch and matrix effects on small-mammal persistence in Amazonian forest fragments. *Biodivers. Conserv.* **2012**, *21*, 1127–1147.
19. Stevens, S.M.; Husband, T.P. The influence of edge on small mammals: Evidence from Brazilian Atlantic forest fragments. *Biol. Conserv.* **1998**, *85*, 1–8.
20. Bianchi, F.J.J.A.; Booi, C.J.H.; Tschamntke, T. Sustainable pest regulation in agricultural landscapes: A review on landscape composition, biodiversity and natural pest control. *Proc. Biol. Sci. R. Soc.* **2006**, *273*, 1715–1727.
21. Brosi, B.J.; Daily, G.C.; Ehrlich, P.R. Bee community shifts with landscape context in a tropical countryside. *Ecol. Appl.* **2007**, *17*, 418–430.
22. Brown, C.; Albrecht, C. The Effect of Tropical Deforestation on Stingless Bees of the Genus *Melipona* (Insecta: Hymenoptera: Apidae: Meliponini) in Central Rondonia, Brazil. *J. Biogeogr.* **2001**, *28*, 623–634.
23. Brown, K.S. Diversity, disturbance, and sustainable use of Neotropical forests: Insects as indicators for conservation monitoring. *J. Insect Conserv.* **1997**, *1*, 25–42.
24. Carvalho, K.S.; Vasconcelos, H.L. Forest fragmentation in central Amazonia and its effects on litter-dwelling ants. *Biol. Conserv.* **1999**, *91*, 151–157.
25. Didham, R.K.; Ghazoul, J.; Stork, N.E.; Davis, A.J. Insects in fragmented forests: A functional approach. *Trends Ecol. Evol.* **1996**, *11*, 255–260.
26. Dohm, C.; Leal, I.R.; Tabarelli, M.; Meyer, S.T.; Wirth, R.; Dohm, C.; Wirth, R. Leaf-cutting ants proliferate in the Amazon: An expected response to forest edge? *J. Trop. Ecol.* **2011**, *27*, 645–649.
27. Guimarães, C.; Viana, J.P.R.; Cornelissen, T. A meta-analysis of the effects of fragmentation on herbivorous insects. *Environ. Entomol.* **2014**, *43*, 537–545.

28. Hadley, A.S.; Betts, M.G. The effects of landscape fragmentation on pollination dynamics: absence of evidence not evidence of absence. *Biol. Rev. Camb. Philos. Soc.* **2012**, *87*, 526–544.
29. Kruess, A.; Tscharntke, T. Habitat fragmentation, species loss, and biological control. *Science* **1994**, *264*, 1581–1584.
30. Kruess, A.; Tscharntke, T. Species richness and parasitism in a fragmented landscape: Experiments and field studies with insects on *Vicia sepium*. *Oecologia* **2000**, *122*, 129–137.
31. Powell, A.; Powell, G. Population dynamics of male euglossine bees in Amazonian forest fragments. *Biotropica* **1987**, doi:10.2307/2388742
32. Ricketts, T.H.; Regetz, J.; Steffan-Dewenter, I.; Cunningham, S.A.; Kremen, C.; Bogdanski, A.; Gemmill-Herren, B.; Greenleaf, S.S.; Klein, A.M.; Mayfield, M.M.; et al. Landscape effects on crop pollination services: Are there general patterns? *Ecol. Lett.* **2008**, *11*, 499–515.
33. Ricketts, T.H.; Williams, N.M.; Mayfield, M.M. Connectivity and ecosystem services: Crop pollination in agricultural landscapes. In *Connectivity Conservation*; Crooks, K.R., Sanjayan, M.A., Eds.; Cambridge University Press: Cambridge, UK, 2006; pp. 255–290.
34. Urbas, P.; Araújo, M.V., Jr.; Leal, I.R.; Wirth, R. Cutting more from cut forests: Edge effects on foraging and herbivory of leaf-cutting ants in Brazil. *Biotropica* **2007**, *39*, 489–495.



© 2016 by the authors; licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).