

# **RAINFOR-AMAZONICA** Newsletter

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NATURAL ENVIRONMENT RESEARCH COUNCIL

GEOQCARBON

# TAKING THE PULSE OF THE WORLD'S BIGGEST TROPICAL FOREST

The Amazon plays a key role in our planet's biosphere, with more life, water, and carbon than any other forest on Earth. RAINFOR partners share a long-term dedication to understanding Amazon ecosystems from the ground up, applying standardized techniques to measure, monitor, and interpret their behaviour.

### **RAINFOR website and social media links**

Stay involved with our social media links, via our Facebook group (**rainfor.project**), Twitter page (**@ForestPlots**) and read up on all news and field campaigns on the website at <u>http://www.rainfor.org</u>

### **RAINFOR Field Campaigns across Amazonia**

Colleagues across South America have been leading new field campaigns to monitor forests across the neotropics. In this newsletter we report on some of the latest work in Brazil and Peru, all part of RAINFOR's aim to understand forest dynamics and changes in the world's richest ecosystem.



Andes, Peru 2013



Researchers and assistants from Wageningen and Oxford Universities observing the T-LiDAR unit as it scans at a rate of 1 million points per minute. Photo by Harm Bartholomeus.

Mato Grosso, Brazil 2013

### **RAINFOR People**

### Esteban Álvarez

Jardín Botánico de Medellín, Colombia



¿Cuándo te uniste a RAINFOR?

En el año 2004 cuando Sandra Patiño regresó a Colombia, y organizamos la primera expedición RAINFOR-Colombia al Parque Nacional Amacayacu (PNNA) en la Amazonia Colombiana. Luego de 10 años de haber sido establecidas, localizamos y recensamos en la parte Sur del PNNA las parcelas Agua Pudre 1 y 2, cerca del rio Amacayacu, y en la parte Norte del PNNA las parcelas Lorena 1 y 2, cerca del rio Cotuhé. Desde ese año he participado activamente en los proyectos de RAINFOR en Colombia.

### ¿Cuáles son tus intereses de investigación?

Contenido y dinámica de carbono de los bosques tropicales; patrones espaciales y determinantes ambientales de la diversidad de plantas tropicales; implementación de proyectos REDD en Colombia; cuantificación y monitoreo de múltiples servicios eco sistémicos de los bosques tropicales.

# ¿En qué proyectos estás involucrado?

Desde el 2001 coordino la Red de Monitoreo del Bosque en Colombia, un proyecto liderado por el Jardín Botánico de Medellín y otras instituciones colombianas como la Universidad del Tolima. la Universidad Nacional de Colombia y la Universidad de Antioquia, entre otras. Entre el 2010-2012 trabajamos en el recenso de 20 parcelas en Colombia, mediante una convenio entre con la Universidad de Leeds y el JBMED. En el 2011 participé en el proyecto Fortalecimiento de la capacidad Institucional, Técnica y Científica para apoyar proyectos REDD en Colombia para afinar las metodologías e interpretación de la relacionada información con cambios en los stocks de biomasa de bosques naturales, para disminuir la incertidumbre en los datos básicos para la estimación de las emisiones de Gases de Efecto Invernadero (GEI). Proyecto

### • Field Campaigns:

Our colleague **Antonio Rigoberto Peña Cruz** posts an impressive and amusing video on the RAINFOR Facebook page, which we would like to share with you all (Yasuni National Park, Ecuador, June 2011):

https://www.facebook.com/photo.php?v=10200169459696701&comment\_id=6 677875&offset=0&total\_comments=2

### May - Nov 2013 – Andes, Peru

Chambasa (Challenging Attempt to Measure Biotic Attributes along the Slope of the Andes) - the local slang in Peru for 'a lot of work' - is the name of a new project that is underway in the Andes. Led by Yadvinder Malhi (Oxford), Brian Enquist (University of Arizona), and Greg Asner (Carnegie Institute), this NERC- and ERC-funded project aims to build and validate a predictive framework for plant community and ecosystem function by integrating information drawn from plant functional traits, airborne remote sensing and metabolic scaling theory. Ultimately, the project aims to facilitate 1) the use of trait-based approaches to predict ecosystem productivity, allocation and nutrient cycling at the plot scale, as well as 2) use hyperspectral remote sensing data to ecosystem productivity, allocation and nutrient cycling at the landscape scale. Trait data are being collected from a series of ten existing 1 ha forest dynamics plots along an elevation transect from lowland rainforest (Tambopata - 190 m asl) to the edge of the Puna grasslands (Acjanaco - 3579 m asl) through the Kosñipata Valley. Trait data includes measurement of morphological, chemical, photosynthetic and hyperspectral properties of a subset of tree species in each plot.

The team in the field is led by Lisa Patrick Bentley, Alexander Shenkin, and Norma Salinas with the hard work and dedication of nearly 20 Peruvian field assistants! When all is said and done, they will have measured more than 30 chemical, structural, physical and anatomical traits on nearly 1000 trees...truly 'a lot of work'!

Yadvinder Malhi and Greg Goldsmith Oxford University, UK





cofinanciado por el Ministerio de Ambiente y Desarrollo Sostenible de Colombia (MADS) y la Fundación Moore. En el 2012 (hasta el 2014) con cofinanciación del JBMED, Colciencias y el apoyo de la Universidad de Leeds trabajamos en el Proyecto "Dinámica del bosque tropical: crecimiento y tasas de fijación de carbono en un gradiente ambiental complejo en Colombia". Vinculado a la ANDEAN FOREST MONITORING NETWORK en la que participan varias instituciones de América, coordinadas por CONDESAN (http://www.condesan.org/). Vinculación a la red Global

Vinculacion a la red Global Ecosystem Monitoring (GEM) en el 2012, coordinado por la Universidad de Oxford. Vinculación en el 2013 a la red DRYFLOR (Latin American Seasonally Dry Tropical Forest Floristic Network) con instituciones de Latino América, coordinadas por el Jardín Botánico de Edinburgo.

# ¿En qué proyectos estás involucrado?

A corto plazo voy a coordinar el Proyecto de Establecimiento de una Red de Parcelas de Monitoreo en el Choco con la financiación de USAID (United States Agency for International Development) como parte de un macro - proyecto liderado por el profesor Sasaan Jet Propulsion Satchi del Laboratory, California Institute of Technology. Este proyecto está dirigido a cuantificar y monitorear los stock de carbono en los bosques más lluviosos del planeta (7000 a 11.000 mm/año). Actualmente estamos negociando la financiación de otros dos proyectos en Colombia. Uno sobre Servicios Ecosistémicos en la Alta Montaña Neo tropical y otro sobre los Impactos del Cambio Climático en la productividad Agrícola y Forestal en Antioquia. Estos proyectos serán co financiado por diferentes instituciones incluyendo el Jardín Botánico de Medellín (JBMED), la Escuela de Ingeniería de Antioquia (EIA), la Universidad CES, Colciencias, la gobernación de Antioquia y el Centro Internacional de Agricultura Tropical (CIAT).

#### **Oct - Nov 2013 – Peru**

A group of researchers from Wageningen and Oxford Universities have teamed up to use laser detection and ranging (LiDAR) technology to produce extremely detailed 3-D maps of 5 RAINFOR/GEM plots across an altitudinal gradient in the Amazon and the Andes region of Peru. LiDAR works by sending out laser pulses and, after the laser reflects off of leaves, wood or other material, measuring the time delay of the reflected pulses millions of times. This is one of the first times a terrestrial LiDAR system has been deployed in tropical forests,.The data from this campaign will be applied to various topics in forest structure research.

> Alexander Shenkin Oxford University



Reflectors are painstakingly placed between neighbouring scan positions to spatially link the data with sub-centimetre accuracy.



A cross-section of a T-LiDAR point cloud from the Tambopata 05 plot, colour coded by intensity of laser return. Wood has a stronger return (yellow) than leaves. While the understory in Tambopata can be dense, the T-LiDAR manages to reach the top of the canopy. Graphic by Harm Bartholomeus.

### **RAINFOR People**

#### Nov 2013 – Mato Grosso, Brazil

#### **Euridice Honorio Coronado**

Instituto de Investigaciones de la Amazonia Peruana (IIAP), Perú



#### When did you join RAINFOR?

I joined RAINFOR in Sept 2003 when I participated in remeasurements of plots in Madre de Dios, southern Peru.

# What are your main research interests?

My research focuses on tropical ecology and I am interested in understanding the ecological and historical processes determining tree species distributions in Amazonia. I am also interested in the carbon dynamics of tropical forests, particularly within the poorly-studied swamp forests of western Amazonia.

## What projects are you involved in?

I have recently finished my PhD studies at the University of Leeds, UK (Oct 09 - May 13) including lab work at the Royal Botanic Garden Edinburgh, UK. My PhD was funded by the Peruvian Government (FINCyT) and the University of Leeds. My PhD thesis investigated the importance of ecological factors and historical events in determining the spatial patterns in the distribution of species, population genetic structure, and phylogenetic diversity in the Amazon rain forest. In particular, I examined the phylogeography of *Ficus insipida* subsp. *insipida* (Moraceae) in order to investigate patterns of spatial genetic structure across the Neotropics and within Amazonia. I also tested whether there are concordant patterns of genetic or uniformity geographic among differentiation five widespread species in western Amazonia, in order to establish if the patterns reflect the impact of Quaternary climate changes or more ancient geological events. Finally, I studied the phylogenetic diversity of Amazon tree communities, using an integrated approach that included exploring the effects of forest type and the ages of geological formations. Together the results demonstrated that both historical and ecological processes have acted over different spatial scales to shape the current distribution of plants and communities in Amazonia.

Adriane Esquivel Muelbert (University of Leeds) helped our Xavantina colleagues Bia and Ben Hur Marimon to install two new permanent forest plots and recensus a 14-year old plot in a transition region between the Amazon forest and the Brazilian savannah. She gave talks on forest conservation for the local community and on Functional Ecology and about her PhD thesis on Floristic and Functional Dynamics in Amazonian Forests to an audience at the University of Mato Grosso, Brazil. She spoke about her PhD thesis in two further Brazilian universities: the Universidade Federal do Rio Grande do Sul and Universidade Federal de Santa Catarina.



Fernando Elias da Silva climbing to collect a voucher in a new forest plot on the transition Amazonia-Cerrado in Mato



New cerrado plot at the transition Amazonia-Cerrado in Mato Grosso, Brazil.

### The team



What are your plans for the future?

My near future involves welcoming our first baby (born at the end of October)! In May 2014, I will be back in my research position at IIAP in Iquitos, Peru to continue my work at the research centre of Jenaro Herrera.



July 2013

Many congratulations to Euridice Honorio for passing her PhD viva on 8 July. Euridice's thesis 'Phylogeography and phylogenetic diversity of Amazon tree species and communities' was supervised by Oliver Phillips at Leeds and Toby Pennington at the Royal Botanic Garden, Edinburgh. The PhD was examined by Jerome Chave (Centre National de la Recherche Scientifique, Toulouse) and Bill Kunin (School of Biology, Leeds).

Simon Lewis organised a symposium, 'Tropical forests and climate change: Linking Models, Plots and Tree Ring Data' (with Pieter Zuidema, Wageningen University), at the Association for Tropical Biology and Conservation (ATBC) 50th Anniversary meeting in San Jose, Costa Rica. Simon also gave a talk as part of the symposium, 'What can 400 long-term plots tell us about the changing ecology of tropical forests?'

Fernanda Coelho and Tim Baker were successful in obtaining a four year PhD scholarship for Fernanda funded by the Ciência Sem Fronteiras programme of the Brazilian government. Fernanda will start her project, 'The evolution of carbon cycling in

### **August 2013**

Amazonian forests', in January 2014.

September 2013

Machu Picchu © Abel Monteagudo



Gabriela Lopez-Gonzalez, ForestPlots.net Database Manager, attended the TRY Open Workshop 'Quantifying and Scaling Global Plant Trait Diversity', in Leipzig, Germany.

David Galbraith, Tim Baker, Yadvinder Malhi and Luiz Aragão, were guest editors for a special issue of the journal 'Plant Ecology and Diversity' entitled 'The Ecosystem Dynamics of Amazonian and Andean Forests'. The special issue has recently been completed and hard copies are now available. The special issue consists of 28 primary research articles in total, most of which have been led by South American authors. Access these papers via the RAINFOR Publications page, here.

Colombia © Joana D'Arc de Paula



Tambopata, Perú © Nadir Camacho

### October 2013

Our colleague Bill Laurence has asked to help promote the ATBC Conference in Cairns (20-24 July 2014). Find out more clicking on the images below. Feel free to spread the word to others!





Manuel Gloor and Oliver Phillips were invited to the Geo-Carbon International Conference 'Towards a Global Carbon Observation System: Progresses and Challenges', at the World Meteorological Organisation, Geneva, 1-2 October. Manuel chaired the sessions on tropical carbon fluxes. Oliver gave the keynote lecture 'What's happening to the planet's remaining intact tropical forests?: a view from the ground'.



### **RAINFOR People**

Rosa Goodman University of Leeds, UK



When did you join RAINFOR?

In September 2009, when I began my PhD at Leeds.

# What are your main research interests?

I am interested in improving forest management and conservation, especially in the context of REDD+. I've specialised in developing allometric models and reducing uncertainty in forest carbon stock estimates.

## What projects are you involved in?

I am currently publishing the results of the last 4 years of work. During a two-year field campaign, I collected the first directly-measured biomass dataset for trees in the southwestern Amazon and developed new allometric models, which account for crown structure. I found that trees have large crowns in this region, compared to other parts of the Amazon, which partially compensates for their lower stature. Next, I collected and compiled the first comprehensive palm biomass dataset for the western Amazon and also developed new allometric models for palms. Using palmspecific models, palm biomass in forests are actually higher than when estimated by dicot tree models. Refining these models will affect carbon stock estimates in western Amazon, and is important for ensuring reliable carbon offset policy measures.

## What are your plans for the future?

I'm moving to California! Ideally, I'd like to work with an international NGO or a private firm on carbon accounting, climate change mitigation, and more sustainable forest and land use management. I'd like to get more involved with people and politics as well, because that's where change happens, and help collaborations between multiple stakeholders.

### • November 2013

Many congratulations to **Rosa Goodman** who successfully passed her PhD viva on 8 November. Her PhD on estimating biomass in tropical forests was supervised by **Tim Baker** and **Oliver Phillips**.

Congratulations also to **Nadir Camacho** (Universidad Nacional de San Antonio Abad del Cusco) and **Joana D'Arc de Paula** (Instituto Nacional de Pesquisas da Amazônia) who recently submitted their theses.

We welcome to the RAINFOR network **Lionel Hernández** (Universidad Nacional Experimental de Guayana, Venezuela) and **Cristabel Durán Rangel** (University of Freiburg, Germany). Our colleagues, Cristabel and Lionel are developing long-term ecological studies in plots in lowland and pre-montane forests in the Guayana Shield in NE Venezuela. Recent papers published by this group are available on the RAINFOR website <u>here</u>:

Durán-Rangel C, Reif A & Hernández L. 2011. Understanding small-scale disturbances in Guayana's montane forests: gap characterization in the Sierra de Lema, Venezuela. *INTERCIENCIA* 36 (4):272-280

Durán-Rangel C, Gärtner S, Hernández L & Reif A. 2012. Do microhabitats in forest gaps influence tree regeneration? A study in the montane forests of Venezuelan Guyana. *ECOTROPICA* 18:93-104

Hernández L, Delgado L, Meier W & Durán C. 2012. Empobrecimiento de bosques fragmentados en el Norte de la Gran Sabana, Venezuela. *INTERCIENCIA* 37 (12):891-898

Hernández L, Dezzeo N, Sanoja E, Salazar L & Castellanos H. 2012. Changes in structure and composition of evergreen forests on an altitudinal gradient in the Venezuelan Guayana Shield. Rev. Biol. Trop. 60 (1):11-33

Scientists from the RAINFOR consortium, participated in the recent study in *Science* led by **Hans ter Steege**, revealing that half the total number of trees in the Amazon rainforest are thought to belong to just 227 'hyperdominant' species. For the first time, plant ecologists have managed to work out which species dominate Greater Amazonia. This required a huge collaborative effort, with more than 100 researchers working in each one of the nine nations of Amazonia. Read the publication <u>here</u> and view the English press release <u>here</u>.

The work is also reported with pictures and story vignettes on some of the leading hyperdominants in the Guardian on-line Environment section:

http://www.theguardian.com/environment/gallery/2013/oct/29/trees-amazon-rainforestin-pictures

### AMAZONICA NEWS

### Final AMAZONICA Meeting - March 2014

The final AMAZONICA Meeting will take place at **São Luiz do Paraitinga, Brazil** from the **24<sup>th</sup>-27<sup>th</sup> March**. This meeting will be combined with another joint Brazilian - UK project (ECOFOR) from 28<sup>th</sup>-29<sup>th</sup> March.

**If you have not confirmed your attendance**, please reply to Joana Ricardo (j.l.s.ricardo@leeds.ac.uk) by mid-January at the latest.

We will be emailing participants further information about how to reserve rooms, airport and transfer details early next year, so please do check your emails.

# RAINFOR People

#### Wendeson Castro da Silva

Universidade Federal do Acre, Brazil



#### Quando se juntou à RAINFOR?

Em 2009, quando participei de recenso de parcelas da rede em liderado por Dr. Ted Acre. Feldpausch (University of Leeds). Estas parcelas de Acre são uma das parcelas mais antigas (algumas com quase 20 anos) de Amazônia e foram instaladas pelo Prof. Dr. Marcos Silveira (UFAC) е colaboradores. Nos últimos quatro anos resgatamos dados de duas parcelas de Acre com censos realizados pré-seca de 2005 e temos trabalhado na melhoria das identificações dos inventários de parcelas da rede em Acre.

### Quais são os seus interesses de pesquisa?

Tenho grande interesse em fitogeografia de ecossistemas tropicais, especialmente, de Amazônia.

### Está envolvido em algum projeto de momento?

Atualmente, estou desenvolvendo mestrado, cujo foco consiste em investigar o [1] 'Efeito do bambu (Guadua spp.) sobre a biomassa arbórea em florestas do Sudoeste de Amazônia', sob orientação do Prof. Dr. Cleber I. Salimon da Universidade Estadual da Paraíba e; [2] a relação entre a resposta espectral e abundância de bambu em Sudoeste da Amazônia, sob coorientação de Dra Liana O. Anderson do Instituto Nacional de Pesquisas Espaciais. Além disto, tenho colaborado com algumas iniciativas do PPBio (Núcleo Regional Acre) em Acre; Participo do projeto "A Better Baseline: Building Capacity and Resources for Forest Inventory in the Brazilian", suportado pela Fundação Moore e coordenado por Dr. D. Daly do The New York Botanical Garden.

### **Ecological collapse in forest fragments**

#### Contribution from William F. Laurance

Centre for Tropical Environmental and Sustainability Science and School of Marine and Tropical Biology, James Cook University, Cairns, Queensland, Australia (bill.laurance@jcu.edu.au)

In a recent article in *Science*, my colleagues and I describe an attempt to understand the impact of habitat fragmentation on native mammals in Thailand. The habitat fragments we studied were islands, created 25 years ago when a large hydroelectric reservoir was constructed in Thailand. The islands range from about 1-60 hectares in area. Larger animals such as deer, tigers and elephants quickly vanished, but a diverse assemblage of smaller mammals persisted, at least initially.

However, as my co-author Tony Lynam discovered, the islands were a place of ecological ruin. Just five years after the reservoir was created, native species had virtually vanished from any island less than 10 hectares in area. By two decades later, things were worse. Another co-author, Luke Gibson, found that hardly any native mammals remained at all, even on the largest islands. However, a highly adaptable invader, the Malayan field rat, was abundant on all of the islands. Either by directly competing with the native mammals or simply eating everything in sight, the field rat seems to have contributed in a big way to their demise.

Our research shows just how severely habitat fragmentation can affect biodiversity when the surrounding habitats are hostile to wildlife. This includes fragments encircled by water as well as those embedded in intensive agriculture, which is expanding rapidly in many parts of the world.

The mammals we studied suffered not only from population isolation, but also from the invading rat competitor. Such foreign species are invading fragmented and other human-disturbed ecosystems across the planet.

The take-home message is obvious: avoid fragmenting native habitats. Too often, it leads to a collapse of wildlife populations. Sometimes, the loss of biodiversity is almost complete.

Gibson, L., A. Lynam, C. Bradshaw, F. He, D. Bickford, D. S. Woodruff, S. Bumrungsri, and W. F. Laurance. 2013. Near-complete extinction of a native small mammal fauna 25 years after forest fragmentation. *Science* 341:1508-1510.



The flooding of Chiew Larn Reservoir in Thailand created scores of small islands like that in the foreground. Photo: Tony Lynam.

#### Que planos tem para o futuro?

Pretendo trabalhar nos próximos dois anos numa proposta de doutorado relacionada à pesquisa de interesse. Além disto, pretendo colaborar com a ampliação de parcelas permanentes em Acre, principalmente, nas regiões central (onde as secas de 2005 e 2010 foram intensas) e oeste (onde há um complexo vegetacional sobre areia branca) e cumprir com as demandas dos projetos pelos quais estou envolvido diretamente.



Best wishes for a Merry Christmas and a Happy New Year!

### Latest RAINFOR and AMAZONICA publications

# The PDFs of most RAINFOR and AMAZONICA publications can be downloaded from our websites. This is intended for tropical students and researchers, and the general public, who cannot afford journal subscriptions.

Castanho ADA, Coe MT, Costa MH, Malhi Y, Galbraith D & Quesada CA. 2013. Improving simulated Amazon forest biomass and productivity by including spatial variation in biophysical parameters. Biogeosciences. doi:10.5194/bg-10-2255-2013

de Almeida Castanho AD, Coe MT, Heil Costa M, Malhi Y, Galbraith D & Quesada CA. 2013. Improving simulated Amazon forest biomass and productivity by including spatial variation in biophysical parameters. Biogeosciences 10:2255-2272. doi:10.5194/bg-10-2255-2013

de Oliveira EA, Marimon BS, Feldpausch TR, Colli GR, Marimon-Junior BH, Lloyd J, Lenza E, Maracahipes L, Oliveira-Santos C & Phillips OL. 2013. Diversity, abundance and distribution of lianas of the Cerrado–Amazonian forest transition, Brazil. Plant Ecology & Diversity 1-10. doi:10.1080/17550874.2013.816799

del Aguila-Pasquel J, Doughty CE, Metcalfe DB, Silva-Espejo JE, Girardin CAJ, Chung Gutierrez JA, Navarro-Aguilar GE, Quesada CA, Hidalgo CG, Reyna Huaymacari JM, Halladay K, del Castillo Torres D, Phillips O & Malhi Y. 2013. The seasonal cycle of productivity, metabolism and carbon dynamics in a wet aseasonal forest in north-west Amazonia (Iquitos, Peru). Plant Ecology & Diversity. doi:10.1080/17550874.2013.798365

Galbraith D, Malhi Y, Affum-Baffoe K, Castanho ADA, Doughty CE, Fisher RA, Lewis SL, Peh KS-H, Phillips OL, Quesada CA, Sonké B & Lloyd J. 2013. **Residence times of woody biomass in tropical forests.** Plant Ecology & Diversity. doi:10.1080/17550874.2013.770578

Goodman RC, Phillips OL, del Castillo Torres D, Freitas L, Cortese ST, Monteagudo A & Baker TR. 2013. **Amazon palm biomass and allometry.** Forest Ecology and Management 310:994-1004. doi:10.1016/j.foreco.2013.09.045

Lima LS, Coe MT, Soares Filho BS, Cuadra SV, Dias LCP, Costa MH, Lima LS & Rodrigues HO. 2013. Feedbacks between deforestation, climate, and hydrology in the Southwestern Amazon: implications for the provision of ecosystem services. Landscape Ecology 1-14. doi:10.1007/s10980-013-9962-1

Malhi Y, Farfán Amézquita F, Doughty CE, Silva-Espejo JE, Girardin CAJ, Metcalfe D, Aragão LEOC, Huaraca-Quispe LP, Alzamora-Taype I, Eguiluz-Mora L, Marthews TR, Halladay K, Quesada CA, Robertson AL, Fisher JB, Zaragoza-Castells J, Rojas-Villagra CM, Pelaez-Tapia Y, Salinas N, Meir P & Phillips OL. 2013. The productivity, metabolism and carbon cycle of two lowland tropical forest plots in south-western Amazonia, Peru. Plant Ecology & Diversity. doi:10.1080/17550874.2013.820805

Marimon BS, Marimon-Junior BH, Feldpausch TR, Oliveira-Santos C, Mews HA, Lopez-Gonzalez G, Lloyd J, Franczak DD, de Oliveira EA, Maracahipes L, Miguel A, Lenza E & Phillips OL. 2013. **Disequilibrium and hyperdynamic tree turnover at the forest–cerrado transition zone in southern Amazonia.** Plant Ecology & Diversity 1-12. doi:10.1080/17550874.2013.818072

Nardoto GB, Quesada CA, Patiño S, Saiz G, Baker TR, Schwarz M, Schrodt F, Feldpausch TR, Domingues TF, Marimon BS, Marimon Junior B-H, Vieira ICG, Silveira M, Bird MI, Phillips OL, Lloyd J & Martinelli LA. 2013. Basin-wide variations in Amazon forest nitrogen-cycling characteristics as inferred from plant and soil 15N:14N. Plant Ecology & Diversity 1-15. doi:10.1080/17550874.2013.807524

Pan Y, Birdsey RA, Phillips OL & Jackson RB. 2013. **The Structure, Distribution, and Biomass of the World's Forests.** Annual Review of Ecology, Evolution, and Systematics 44 (1):593-622. doi:10.1146/annurev-ecolsys-110512-135914

Rowland L, Malhi Y, Silva-Espejo JE, Farfán-Amézquita F, Halladay K, Doughty CE, Meir P & Phillips OL. 2013. The sensitivity of wood production to seasonal and interannual variations in climate in a lowland Amazonian rainforest. Oecologia.

ter Steege H et al. 2013. **Hyperdominance in the Amazonian Tree Flora.** Science 342 (6156):1243092. doi:10.1126/science.1243092

van der Heijden GM, Schnitzer SA, Powers JS & Phillips OL. 2013. Liana Impacts on Carbon Cycling, Storage and Sequestration in Tropical Forests. Biotropica. doi:10.1111/btp.12060

If you have any news, photos, publications or announcements for the next Newsletter, please email: Joana Ricardo (j.l.s.ricardo@leeds.ac.uk)

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