



Synthesis of Tree Biodiversity in Tropical America with Plot Inventories



Rio Nanay, Amazon, Peru.



SynTreeSys compiles the available plot-based knowledge of tree biodiversity across Tropical America to address fundamental ecological and biogeographical questions. Thanks to your invaluable contribution, we are conducting a novel and unparalleled compilation of vegetation inventories from multiple networks, to bring a step change to our understanding of tree biodiversity in Latin America.

The project's primary objectives are: (1) assessing patterns and drivers of tree diversity and dominance, (2) mapping hotspots of exceptional tree species turnover, and (3) evaluating the IUCN conservation status of tropical tree species in America.

Funded by the Center for the Synthesis and Analysis of Biodiversity of France (FRB-CESAB), since 2022 the project has been developed through five in-person workshops, and additional online meetings (details on the left), where participants worked together on specific workflows needed to achieve the objectives outlined above.

Updated interactive plot map [here](#)

5th SynTreeSys workshop, June 2024 CESAB, Montpellier (France)

The participants worked in three teams to advance the three main scientific manuscripts being produced. This second newsletter will highlight these advances on the database and the three main manuscripts:

Database harmonisation - a consolidated database ready for data analyses!

A new version of the database was released including 65 plots from Panama (ForestGEO) and 2802 plots from Mexico: MONAFOR (Monitoreo Nacional Forestal). Based on the vegetation types look up table developed in the previous workshop, affiliation of each plot to the [IUCN typology of Ecosystem Functional Groups \(EFG\)](#) was assigned including manual verification for particular cases.



12 networks ~13000 plots ~840 collaborators



Previous workshops:

Workshop 1 (May 2022): a common data structure, mandatory metadata were defined.

Workshop 2 (November 2022): definition of the SynTreeSys data sharing agreement, and discussion of hypotheses, and publication plan.

Virtual meeting (April 2023): Discussion on data request and cross-network data harmonisation.

Workshop 3 (June 2023): taxonomic standardisation finalised in collaboration with the World Flora Online (WFO), Definition of structure of the scientific papers and associated data.

Virtual meeting (September 2023): Future funding, and extended collaboration with researchers from Costa Rica and Mexico.

Workshop 4 (December 2023)
Hosted by Instituto Alexander von Humboldt, Colombia
Enhanced connections and communication among Latin American researchers and policymakers, progress in the goals of SynTreeSys products.

Webinar series

Each of the working groups will invite the SynTreeSys community to participate in an online presentation and discussion of initial progress of the manuscripts. So please mark your calendar as the dates below for each publication.

PUBLICATIONS in Progress

1. Synthesis of Tree Diversity:

Reference numbers of tree diversity are difficult to source, and when available, generally are reported at national level. SynTreeSys has the potential to provide improved ground-based numbers for each of Latin America's major biome types (e.g., tropical rain forest, dry forest, montane forest, savannas), which span country boundaries. This short paper will describe the main features of tree diversity across biome types in tropical America, including total species numbers per biome, 'endemic' (unique) species per biome and shared species across biomes.

- **Webinar: 11/07/2024 (9-10am GMT-5 Bogota, 4-5pm CET Paris).**

2. Drivers of Alpha Diversity:

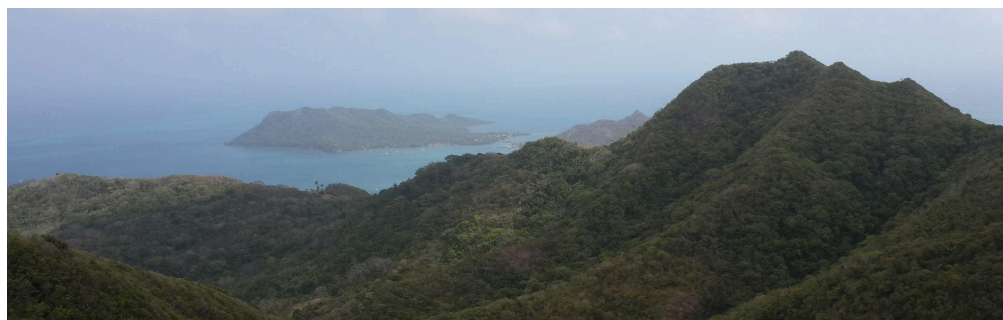
America's tropical biomes are the most diverse on Earth and therefore challenging to inventory, let alone understand. While we know some of the environmental drivers of diversity, our understanding remains incomplete, in particular because few studies so far spanned across biomes and large scales. As a result, it is unclear whether drivers of tree community species richness are consistent across biomes at large scale. This project aims to resolve this question by evaluating abiotic drivers of tree diversity across tropical woody biomes.

- **Webinar: 24/09/2024 (9-10am GMT-5 Bogota, 4-5pm CET Paris).**

3. Vulnerability of Tree Species and Communities to Global Change:

Tropical biomes are particularly threatened by global change drivers, but we lack a general understanding of tropical tree species sensitivity to climate change, thereby limiting our predictive ability of the future of tropical biomes. In this study, we are mapping the distribution of tree species across tropical Americas to investigate: (a) The spatial patterns of species composition; (b) how many trees have been lost as a consequence of land use changes; (c) determine the climate sensitivity of tropical America tree species and (d) examine how future changes in climate and land use will affect species composition of tropical American forests.

- **Webinar: 04/09/2024 (9-10am GMT-5 Bogota, 4-5pm CET Paris)**



The Peak-Isla Providencia, Caribbean, Colombia

Branch projects

Before called 'Satellite Projects', three branch projects were presented during the workshops led by early career researchers:

Guilherme Gritz - PhD student at the Universidade de São Paulo (Brasil)
Title: *Endemism, extinction risk, and evolutionary distinctiveness of the Neotropical arborescent flora.*

Viviana Ceccarelli - PhD student at the University of Leeds (UK)
Title: *Tree Hyperdominance: Success and vulnerability of tropical America's forest.*

Estelle Darko - PhD student at the University of Birmingham (UK)
Title: *Contribution of rare species to the functional space across environmental gradients.*

Workshop 5 Montpellier, June 10-14, 2024



Photo of Workshop 5th participants in front of CESAB building, Montpellier, France

Guilherme Gritz
Viviana Ceccarelli
Estelle Darko
Ricardo Segovia
Tamara Heartsil-Scalley
Renato Lima
Toby Pennington
Karina Banda
Géraldine Derroire
Claire Fortunel
Roy Gonzalez
Jérôme Chave
Adriane Esquivel
Filipe França
Hans ter Steege
Oliver Phillips
Jesus Aguirre
Moabe Fernandes

Next workshop:

December 2-6th, 2024

SynTreeSys Conference Participation

26th IUFRO World Congress,
Stockholm - June 23-29, 2024

Using historical tree plot inventory data to investigate the biogeography of Tropical America

Abstract: Tropical America, including the Caribbean, harbours the highest species diversity compared to any other region in the world. However, this remarkable diversity is facing severe threats from climate and land use change. While plot inventory networks have been successful in generating syntheses on biodiversity patterns and ecosystem functioning; cross-biome, plot-based studies in the tropics are rare, preventing the identification of general vs biome-specific responses to global change drivers. To address this knowledge gap, the SynTreeSys project is utilising world-leading expertise in tropical ecology to conduct a comprehensive assessment of tree species diversity patterns and its conservation status across the region. To achieve this, we are constructing a harmonised database to i) identify spatial patterns of tree diversity and dominance and the underlying causes of their variation, ii) detect zones of exceptional species turnover and, iii) to assess tree species conservation status in tropical America.

One of the challenges in tropical regions is ensuring the homogeneous representativeness of biodiversity datasets. In areas with limited information or extensive land use transformation, historical data becomes a valuable source. The SynTreeSys-generated database covers a time span of almost 90 years, with approximately 10% of the plot data collected before 2000. The oldest dataset available dates back to 1934, comprising inventory plots documenting the vegetation of Moraballi Creek in Guyana, published by T. A. W. Davis and P. W. Richards, and gathered by the Amazon Tree Diversity Network (ATDN). In SynTreeSys, we emphasise the importance of "old" data, not only for the inherent value it holds but also for the rich narrative of the studies and their ability to provide historical and detailed descriptions of habitats, vegetation structure, soil, and even species interactions.

Date: June 27, 05:30 - 05:45 PM (CEST)

Session: Legacy tropical forest data: current status, uses, and securing them.

XX International Botanical
Congress, Madrid - July 21-27, 2024

Understanding patterns of biogeography and threat of tree species diversity across the Latin American biomes

Abstract: Tropical America has greater biodiversity than any other region of the world, but its biomes are under severe threat from climate and severe land use changes. Over recent years, plot inventory networks have successfully generated syntheses on biodiversity, ecology and ecosystem function. SynTreeSys, a new integrative initiative supported by CESAB (Centre for the Synthesis and Analysis of Biodiversity in France) is gathering knowledge of tree biodiversity across all biomes and gradients of rainfall and climate in Latin America, in order to dissect the patterns of tree diversity, abundance and threats. These inventory plot data offer much to assess species conservation status. Such conservation assessments can be made using herbarium specimen records, but these records have sampling biases and, critically, give no information about species population size and trends.

The lack of such basic information prevents us from defining where conservation actions could be strategically implemented to best preserve tree diversity in the region, and to generate future scenarios based on known macroeconomic, climatic and land-use drivers. Here, we will present examples from different biomes and regions that examine species' geographic ranges (IUCN criterion B), and population sizes and potential declines (criteria A, B and D), following the International Union for Conservation of Nature (IUCN) framework. We will show how inventory plot data can be used to estimate tree species population size as has been previously done for the Amazon and Mata Atlantica but across other biomes. Population decline can be estimated by crossing such species abundance maps with layers of vegetation cover change. We will show how abundance and population estimates can inform more accurately the conservation status of tropical tree species of all the biomes of Latin America.

Date: July 23, 12:00 - 12:20 PM (CEST)

Session: Plant diversity, biogeography and evolution in the tropics for sustainable use.