

# Forests on the Move: Forest inventories and wood anatomy from the fragmented forests of Guairá, Paraguari, and Central, Paraguay

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## Introduction & Background

Since the 1970's Paraguay has become one of the most deforested countries in the world, what was once a mega diverse forest ecosystem has become a biological hotspot in peril. Wood anatomy research and forest inventories were conducted within the subtropical Republic of Paraguay. Objectives of this study were twofold:

- Document anatomical characteristics of 16 hardwood species from three botanical families (Fabaceae, Meliaceae, Myrtaceae) with compound light microscopy to observe, compare features across families.
- Generate forest inventory field data from eight different sites: three in federally protected areas (National Park Ybycui, Natural Monuments Cerro Koi, Cerro Choroi), and five in private forests of Guaira and Central, Paraguay.

## Questions & Assumptions

- What are the forest structures that will be observed?
- What will degree of diversity / dominance will species, families be present in the field?
- Will wood anatomy characteristics be identical of sample species pertaining to the same botanical family?

## Methods

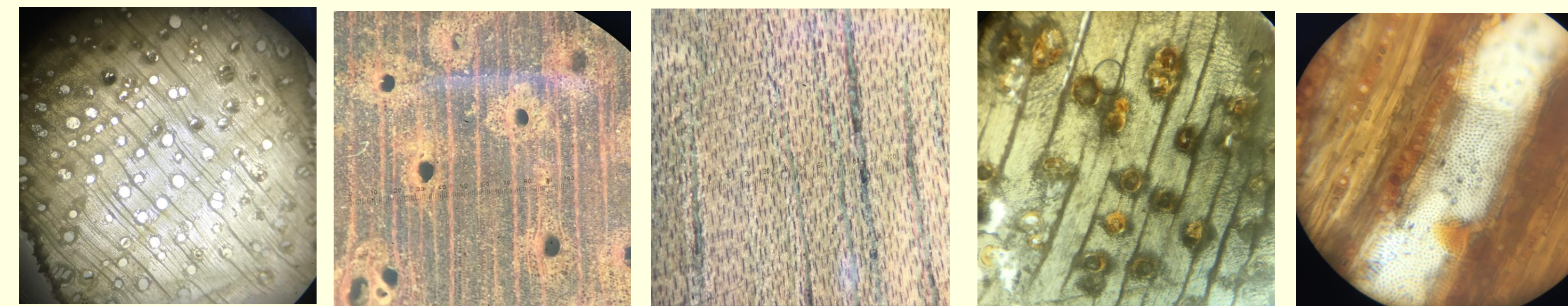
### Wood anatomy investigation

- 15 samples were collected from downed trees in the forest of, *Jacare Piru*, Paraguay and from a lumber mill in Luque, Paraguay.
- Wood was identified, processed into small samples, and analyzed in the transverse, radial and tangential planes with a compound light microscope following descriptions, terminology by IAWA Committee.
- Data collected includes: Vessel orientation, diameter, length. Axial parenchyma patterns. Pit patterns. Fiber length, descriptions. Ray height, descriptions. Presence of extractives.

### Forest structure investigation

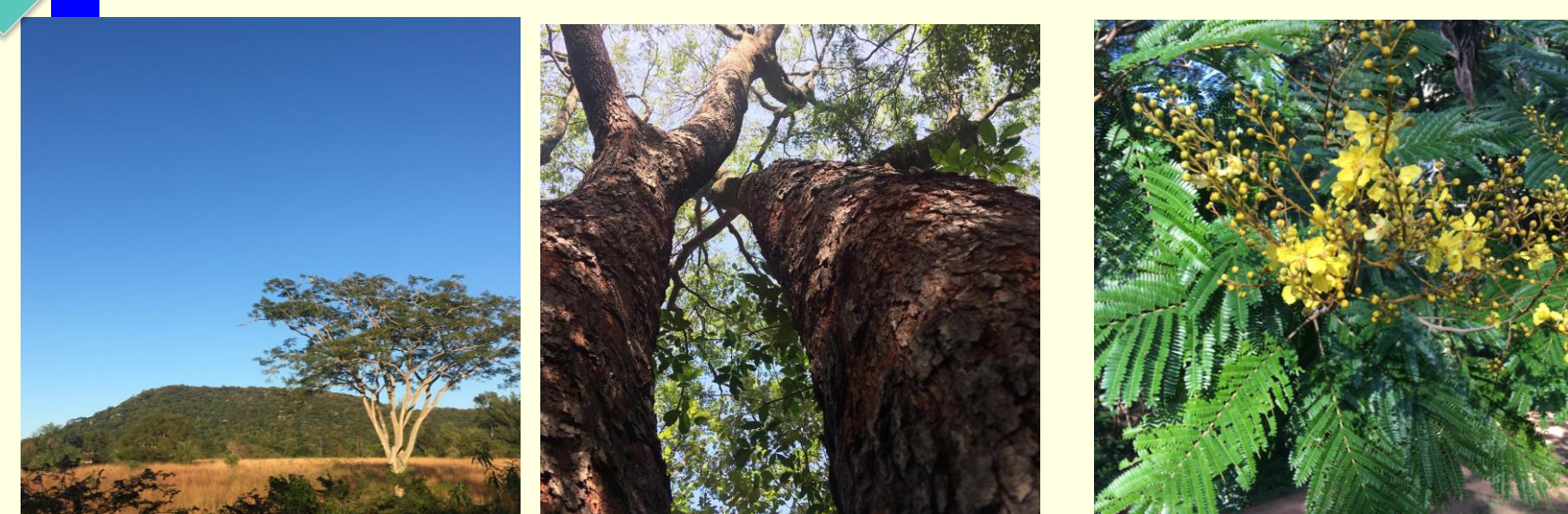
- Methods and protocols follow FAO Voluntary Guidelines National Forest Monitoring (2017).
- Plots measuring 10x10 m (100 m<sup>2</sup>) were selected randomly within the limitations of each site.
- Data collected includes: species identification, taxonomic density, height, diameter at breast height, ground cover percentages, & forest categorization.

## Preliminary Results

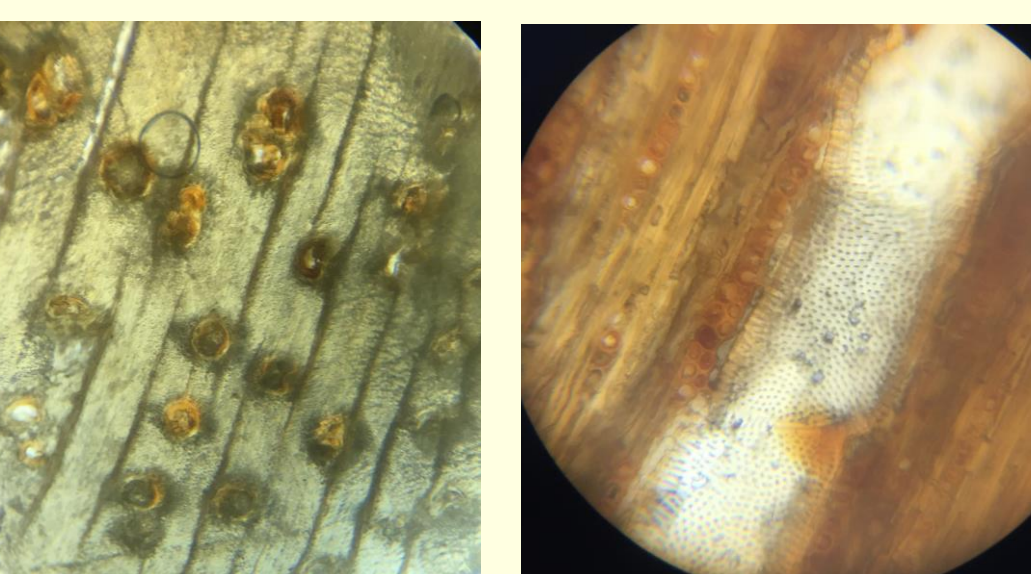


### FABACEAE

Species studied: *Anadenanthera colubrina*, *Enterlobium contrortosiliquum*, *Pithecellobium scalare*, *Pterogyne nitens*  
 Species to study: *Albizia niopoides*, *Copaifera langdortii*, *Peltophorum dubium*



## Wood anatomy investigation:



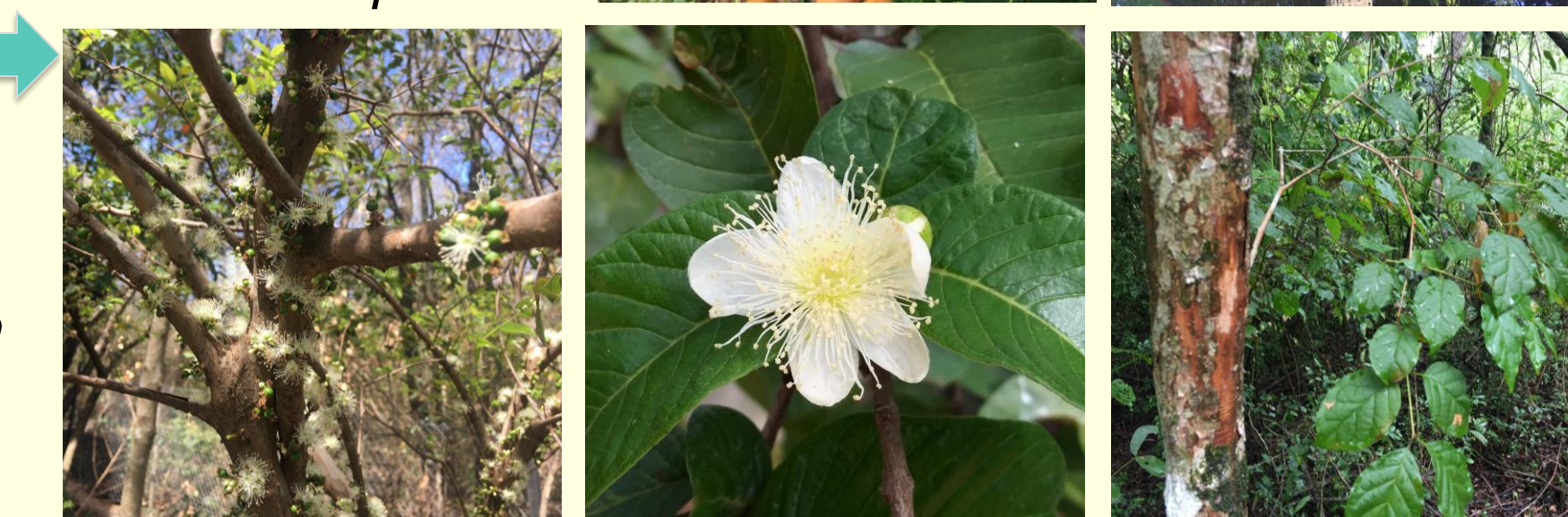
### MELIACEAE

Species to study: *Cabralea canjerana*, *Cedrela fissilis*, *Melia azedarach*, *Trichilia pallida*



### MYRTACEAE

Species to study: *Campomanesia xanthocarpa*, *Myrciaria rvularis*, *Plinia trunciflora*, *Psidium guajava*

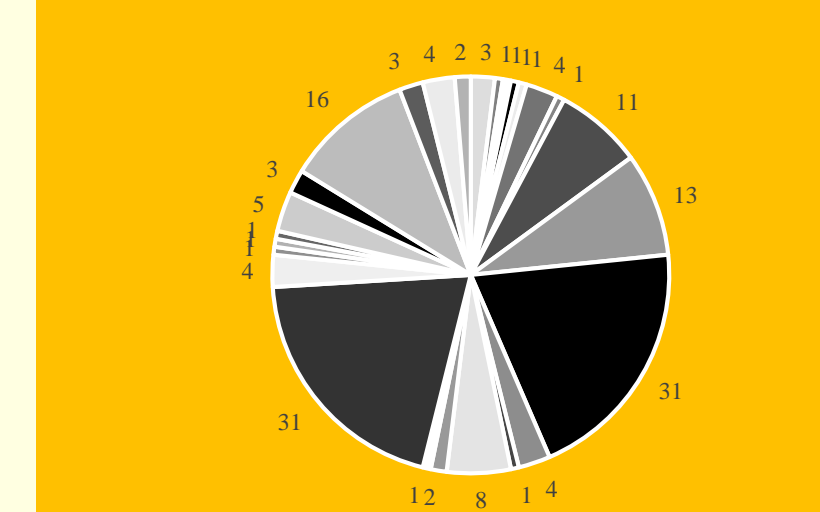


## Forest structure investigation:

Forest formations observed include: low forest, semi-deciduous humid forest, and gallery forest. A total number of 860 individual samples were identified, measured, and 35 different botanical families were represented

Privately owned forests (Guaira & Central Departments)  
 Total spp: Guaira 1 (206), Guaira 2 (186), Yacare Piru (136)

### PNY Family Dominance Plots 1-6



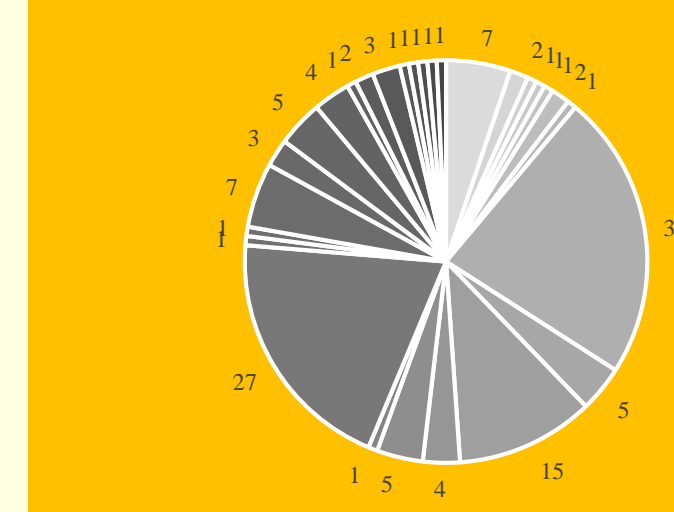
### Federally protected forests:

Total spp. National Park Ybycui (151), Cerro Koi (109), Cerro Chorori (202).

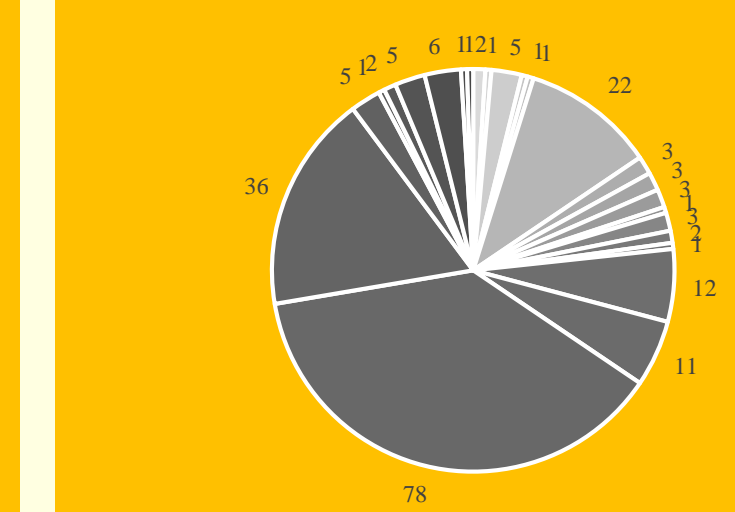
### Dominant Families

- PNY: Fabaceae (31), Rutaceae (16)
- Koi: Arecaceae (40), Fabaceae (27)
- Chorori: Anacardiaceae (38), Fabaceae (36)

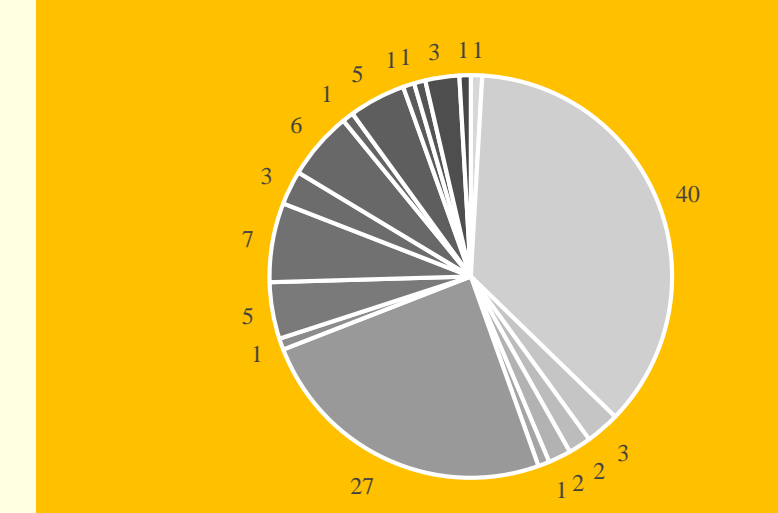
### Yacare Piru Family Dominance Plots 1-9



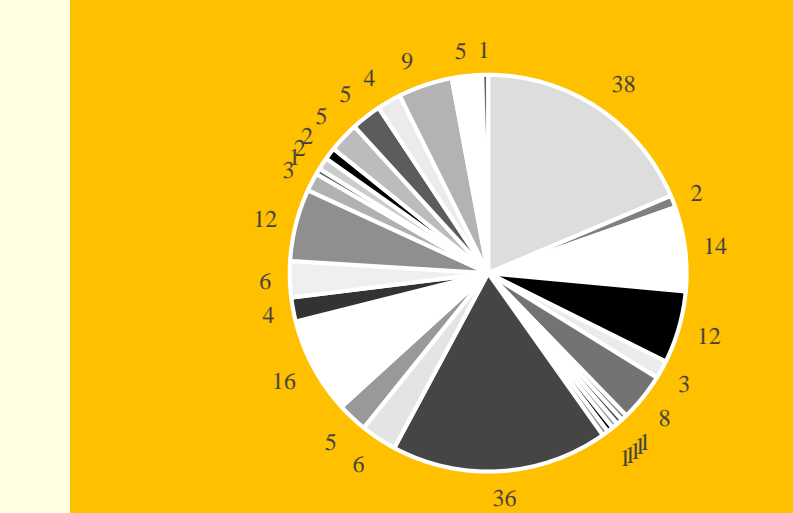
### Guaira 1 Family Dominance Plots 1-6



### MNCK Family Dominance Plots 1-9



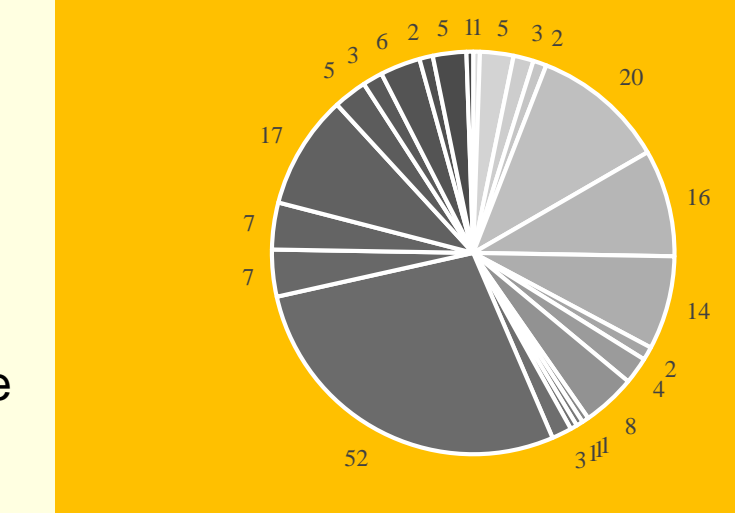
### MNCC Family Dominance Plots 1-9



### Dominant Families

- Guaira 1: Rutaceae (78), Sapindaceae (36), Fabaceae (22)
- Guaira 2: Rhamnaceae (52), Fabaceae (20), SA Unknown (17), Central: Fabaceae (31), Myrtaceae (27), Lauraceae (15)

### Guaira Region 2 Family Dominance Plots 1-6



## Interpretation

The scope of inference for this project applies to the Ministry of the Environment and Sustainable Development, park guard of the respective protected areas, for management strategies of protected areas. Furthermore, local landowners who want to actively manage their forests can benefit from this information. Additional parties that can benefit from the information provided in this study include: wood scientists interested in the anatomical characteristics of flora native to the region.

With a deeper understanding of the characteristics of forests, habitat, distribution, and botanical family dominance, we can manage forests more efficiently and sustainably.

Furthermore, with an increased understanding of anatomical characteristics of wood sourced from the forests, we can use wood in manners more effectively, to maximize usage, reduce waste, and conserve natural forests.

Future studies could include repeated inventories in protected areas, and in privately owned forests in Paraguay. More in-depth wood anatomy investigation can also be done with important and non-important tree species.

## Importance

This study is important because it continues the conversation of understanding the forests in central South America. Better understanding exotic hardwood species of a fragmenting and megadiverse forests contributes to the international field in many ways including: general awareness of dendrological diversity, information on wood anatomy structures across botanical families, and field data that can allow for further investigation to build upon.

## Acknowledgments

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## References

- FAO. (2017). Voluntary Guidelines on National Forest Monitoring. Rome.
- FAO, Pérez de Molas, L.P. (2016). Manual de Familias y Géneros de Árboles del Paraguay. San Lorenzo, Paraguay.
- InsideWood. 2004-onwards. Published on the Internet. <http://insidewood.lib.ncsu.edu/search> [8/4/2021].
- IAWA. (1989). IAWA list of microscopic features for hardwood identification. IAWA Bull n. s. 10:220-332.
- Lopez, J.A., Little, E., Rits, G., Rombols, J., Hahn, W., and Cuerpo de Paz. (1987). Arboles Comunes del Paraguay: *Nandeyvyramatakueru*.