Wood Identification Technologies for CITES Implementation

Forest Legality Alliance
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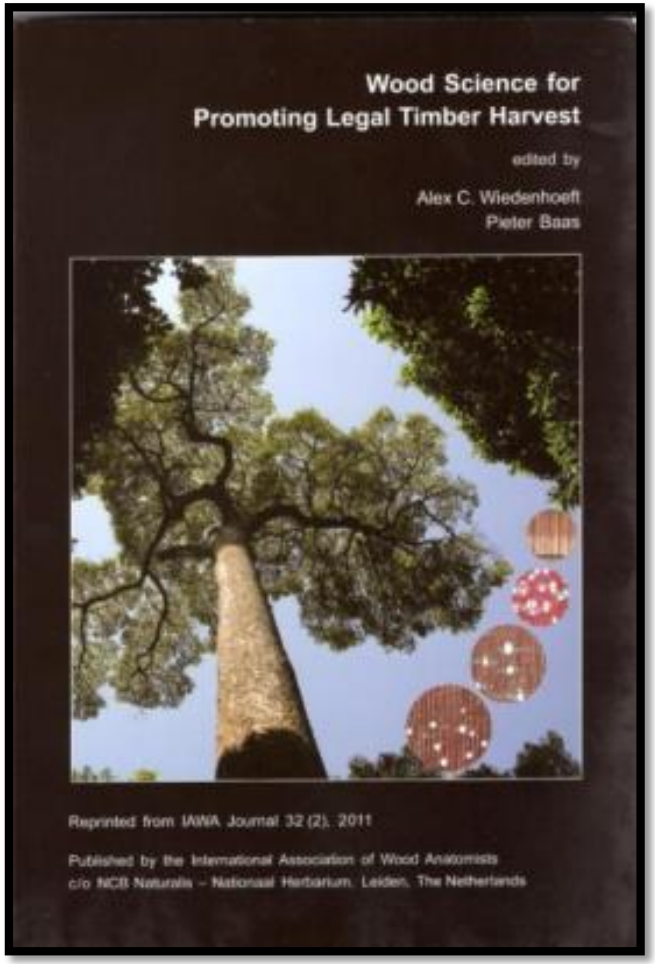
State of the science for CITES wood forensics

Two sources of variability in wood

- Structural variability
  - Traditional wood identification
  - Fiber testing (pulp and paper)
  - Machine vision wood identification
- Molecular variability
  - Chemical fingerprinting
  - Near infrared spectroscopy (NIRS)
  - Stable isotopes
  - DNA methods



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The ways in which these things are relevant to CITES enforcement depend on the nature of CITES itself

What are some ‘scientific’ strengths of CITES?

- **It exists!** (We have something to work with)

- **It is an affirmative list** (We have specific hypotheses to test, and we control the question)

- **We have resources and a built-up global network** (Countries invest effort in implementation)

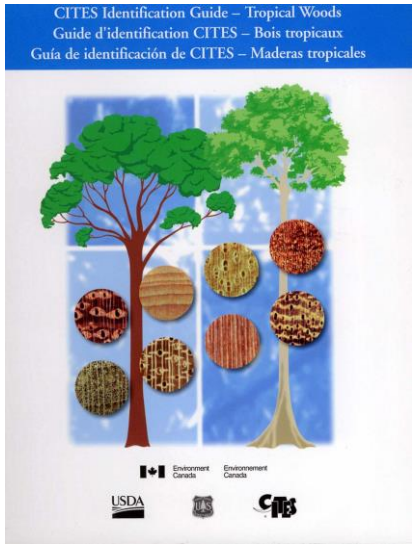
What are some ‘scientific’ concerns about CITES?

- **Species circumscription** (e.g. *Dalbergia retusa* and *D. granadillo*)
- **Political and not biological boundaries** (Appendix III)
- **Reference material for calibrating methods** (e.g. Madagascar)
- **Availability of screening technology and implementation** (what is available and deployable yesterday?)
- **Availability of forensic methods and implementation** (does forensic capacity scale with enforcement action?)

Seventeen years of CITES work

Historically, my work has been old-school

- Co-wrote the original CITES field manual for tropical timber identification (Miller, Wiedenhoeft, and Ribeyron 2002)



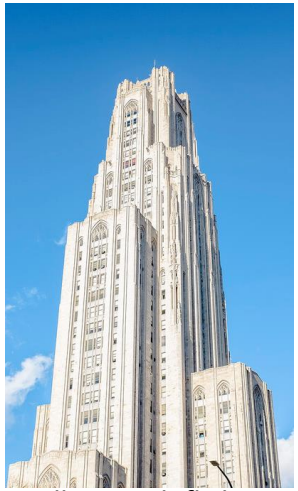
- Train-the-trainers capacity building
  - Nicaragua (2007, 2008)
  - Honduras (2007)
  - Singapore (2007)
  - USA (2002, 2005)

- Forensic support for CITES enforcement
  - APHIS-PPQ (ongoing)
  - CBP (ongoing)

Lessons learned: technological integration is key

- Scientific rigor
  - This is at a premium. Not all techniques rest on equally strong foundations, not all labs perform to the same levels
- Open access to information and active communication
  - Scientific data
  - Law enforcement data
  - Build a cooperative forensic workflow

How do we achieve technological integration and demonstrate real-world relevance?



Billie Ward, flickr
https://www.flickr.com/photos/wwward0/22752581253

or

The difference between the ivory tower and boots on the ground

There are many answers to that question.

Wood anatomists have a suggestion:

WRAITH

Not so much this.

More like this.

WRAITH

Wood **R**esearch **A**gainst **I**llegal **T**imber **H**arvest

An officially sanctioned Task Force of the International Association of Wood Anatomists (IAWA)

Action items for WRAITH:

1) Foundational research*

2) Standards-setting and proficiency verification

3) Press-release-style inauguration

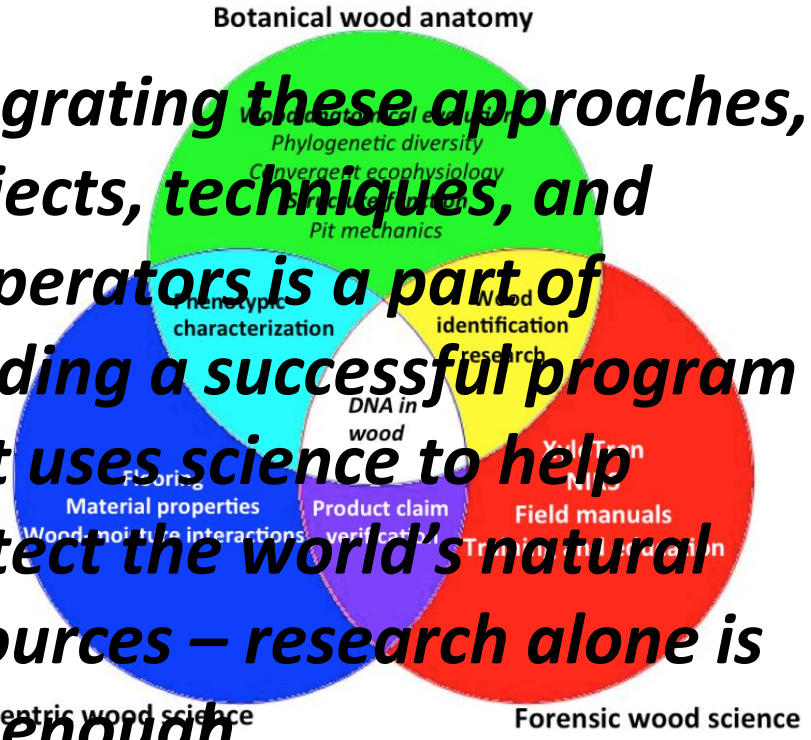
4) International networking among players in these fields

5) Official outreach and communication by IAWA to disseminate information and encourage cooperation

Okay, why wood anatomists?

Wood forensic research in my lab

- Traditional wood anatomy
  - *Acer*, *Pinus*, *Swietenia*
  - Product claim verification
- DNA isolation
  - Organellar microcapture
  - Optimization of bulk extraction
- NIRS cooperation (Brasilia, Brazil)
  - Identification of mahogany, cedar
- XyloTron
  - Biogeographic regional emphasis
    - Pan-Amazonian
    - Sub-Saharan tropical Africa
  - Botanical feature detection



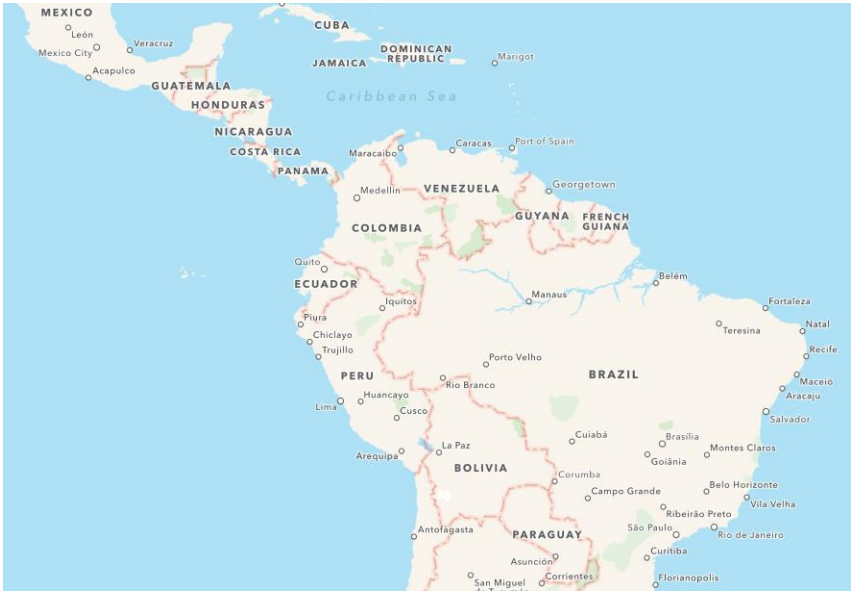
Integrating these approaches, projects, techniques, and cooperators is a part of building a successful program that uses science to help protect the world's natural resources – research alone is not enough

#XyloLab

- Twitter
  - **#XyloLab**, #CWARXyloTron, #XyloTron
  - @CWAR_ACW (me)
  - @adridcc (postdoc Adriana Costa)
  - @epiphyto (postdoc Rafael Arévalo)
- Instagram (just getting started!)
  - xylolab.mad
- FPL resources
  - Website: www.fpl.fs.fed.us
  - Blog: http://www.fpl.fs.fed.us/labnotes/
    - Search “wood anatomy”
- Email: acwieden@wisc.edu

Pan-Amazonian XyloTron and broad technological integration

- Current partner:
  - Brazil
- Future partners:
  - Peru (pending)
  - Colombia (nascent, and leveraged through Brazil)
  - Ecuador (nascent)
  - Bolivia (leveraged through Brazil)



Tropical sub-Saharan Africa XyloTron and broad technological integration

- Current partner:
  - Ghana
- Future partners:
  - Kenya, Tanzania, Uganda (nascent, support sought)
  - Cameroon?
  - Congo Basin cooperators?