



Science and technology to meet legislative and market requirements



Science and technology to meet legislative and market requirements:

Government Perspective

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U S F O R E S T S E R V I C E *international programs*

- Technical Cooperation
- Policy
- Disaster Programs
- Outreach and Partnerships

www.fs.fed.us/global



Policy and legislative context

Forests and Forestry – U.S. Approach

- Value and take account of **multiple goods and services** of forest ecosystems – promoting sustainable forest management
- Address **underlying causes** of deforestation (e.g., tenure, corruption, perverse incentives)
- Support **participatory approaches** - raising awareness and building capacity through bilateral and multilateral efforts
- Base policy on the best available **science**
- Strengthen transparency and accountability in the international **trade in forest products**.

Policy and legislative context

U.S. Efforts to Strengthen Forest Governance & Combat Illegal Logging and Associated Trade

- MOUs with Indonesia and China
- Asia-Pacific Regional Dialogue
- Commitments in trade agreements
- Bilateral and regional assistance for forestry
- Support for ITTO Programs and Projects
- Support for RAFT and Forest Legality Alliance
- Amended Lacey Act - adds an enforcement tool
- **Investment in legality assurance technologies**



Wood science meeting legislative and market requirements

- Compliance and enforcement of policy - Lacey Act and CITES
- Forensic support
 - Wood identification
 - Genus, species
 - Geographic Origin
- Applying science to timber tracking
- Developing new methods
- Informing policy and promoting trade of legally harvested wood products





Wood science – USFS initiatives and international collaboration

USFS Forest Products Laboratory
USFS International Programs

- Classical laboratory analysis - wood anatomy
- Field identification manuals
- Training field personnel
- Machine vision automated wood ID
- Fingerprinting methods - DNA and stable isotopes
- Applying science to timber tracking
- Integrating technologies
- Technology transfer and outreach





Classical laboratory analysis - microscopy

- Depends on highly specialized scientific expertise and access to xylarium
- USFS FPL long standing history
- Center for Wood Anatomy Research



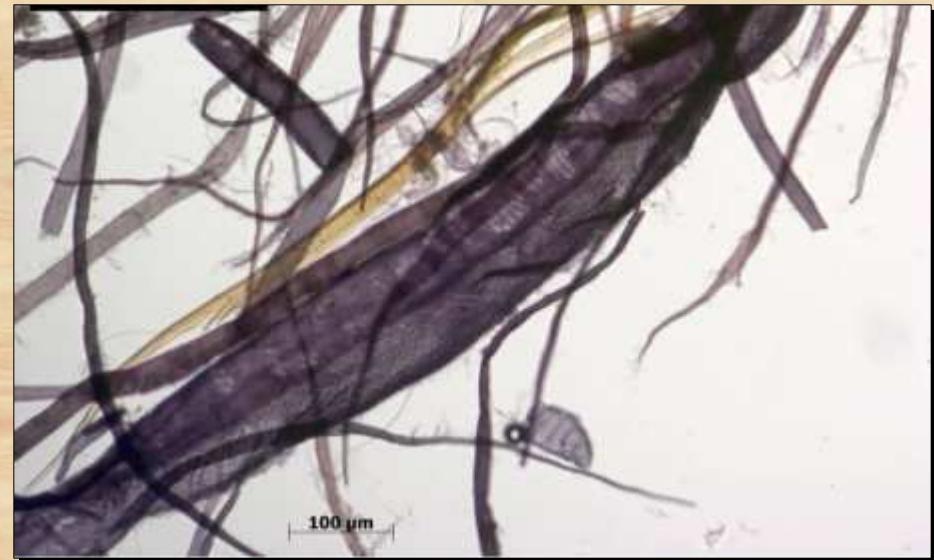
- Traditional analysis of seized material
 - CITES violations
 - Lacey violations

Content verification: fiber analysis of pulp and paper products

Pulp and paper microscopy

Experts can determine:

- Pulping process (mechanical, chemical)
- Wood type (e.g. hardwoods, softwoods)
- Genus, sometimes species



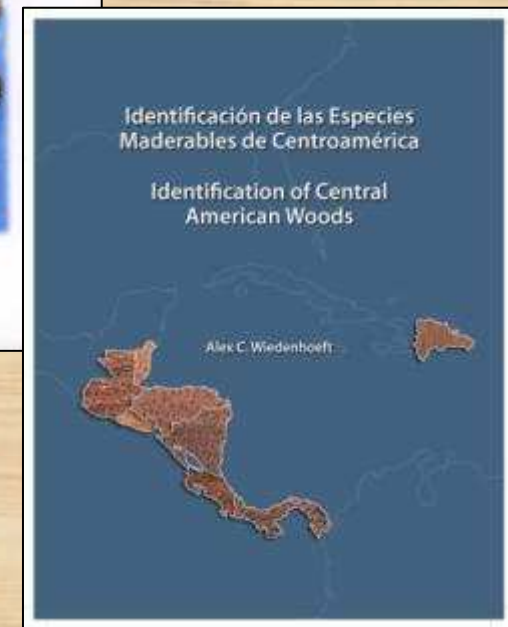
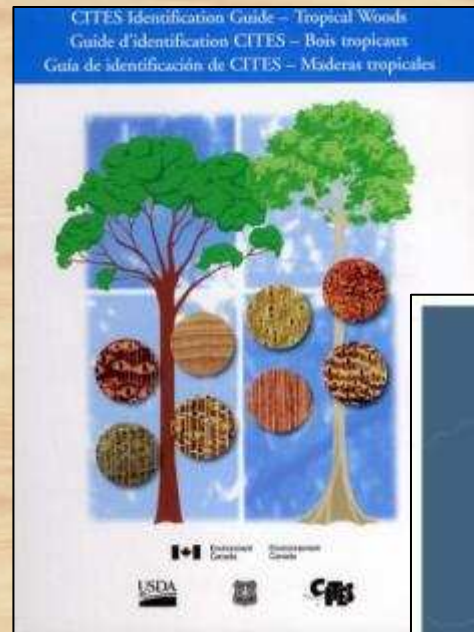
FOREST LEGALITY
ALLIANCE



Field identification manuals

Alex C. Wiedenhoft, Research Botanist

- CITES Tropical Timber Manual
 - 2002: English, French, Spanish, Polish, Chinese
- Identificación de las especies maderables de Centroamérica
 - 2011: Spanish, English





Machine vision wood ID

Alex C. Wiedenhoft, Research Botanist
John C. Hermanson, Research Scientist

- Field manuals and training inefficient
- Research into more efficient identification is necessary
- Use computers and sensors to develop portable, handheld identification application

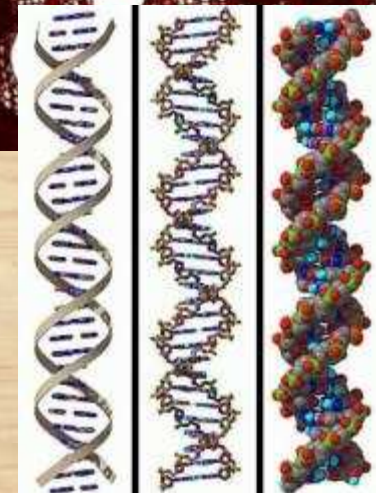
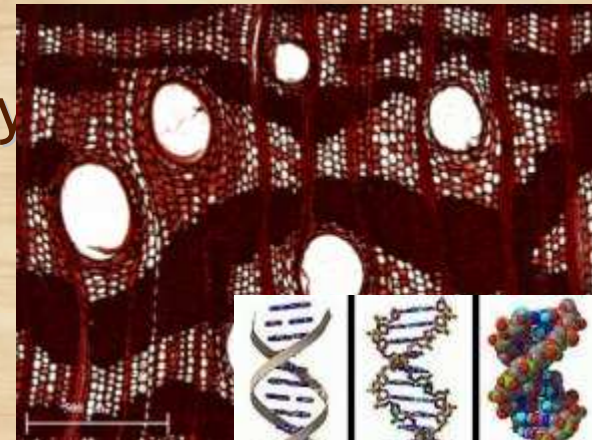




Wood anatomy of molecular techniques

Alex C. Wiedenhoft, Research Botanist
Brook Milligan, NM State University

- Improving efficiency in extracting DNA of sufficient quality and quantity from wood products
- Identify DNA in wood - predictably located in certain cells
- Pre-processing specimens can maximize extraction efficiency
- Evaluate extractions





Fingerprinting methods genetic verification



- Forensic Network
- USFS National Forest Genetics Laboratory
 - Forensic analysis in cases of timber theft
 - Distinguishing individuals within a population
- US Fish & Wildlife Service National Forensics Laboratory
 - Dedicated to crimes against wildlife
 - Case history example - fraudulent interstate salmon sales



The US Fish and Wildlife Service Forensics Lab.
Credit: USFWS



Lab scientist at work.
Credit: USFWS

Fingerprinting methods R&D

vTI Institute of Forest Genetics - Germany

- ITTO-Project: *Development and implementation of a species identification and timber tracking system with DNA fingerprints and stable isotopes in Africa*
- Pilot study: timber tracking and species identification of Russian larch and Mongolian oak Russia-Germany-US
 - Russian Academy of Sciences



Honduras



Study DNA of timber fingerprinting
Russian Academy of Sciences

DoubleHELIXXX



Tracking legal timber from forest...



...to client



Complementary technologies

Scientific, tamper-proof systems where technologies verify genus, species, geographic origin anywhere along supply chain.

Chain of custody documentation

- Falsifiable and substitutable

Wood Anatomy

- Taxonomic identity but not always to species

Stable isotopes

- Geographic origin on a regional scale

Molecular genetics

- Individual identity
- Taxonomic identity, often to species
- Geographic origin



The way forward - collaboration

- **Technology transfer and outreach**
 - Public–private partnerships
- **International Barcode of Life (iBOL)**
- **Tree Barcode of Life (TreeBOL)**
 - Smithsonian Institute
- **International Center for Identification of Timber Species and Origins, Bioversity International**
 - Steering Committee