Building Genetic Reference Libraries to Combat the Illegal Timber Trade

Illegal logging destroys forests, disrupts ecological processes, increases CO_2 in the atmosphere, and bankrolls dangerous political corruption. Port officials, law enforcement officers, corporations, and everyday consumers require new tools to trace wood-products back to their extraction points. Cutting-edge genetic technologies can help, but in order to do so, they will require extensive reference materials from high-value timber species. By collecting these currently unavailable samples, this project will unlock the potential of DNA-based technologies to combat illegal logging.

Ecological Threats and Technical Challenges
Tropical deforestation accounts for about 10% of global carbon emissions. On the international market, more than half of all timber coming from key tropical forests has been illegally harvested, and up to three out of ten finished wood products have been illegally sourced. This $100-billion criminal sector rivals the international heroin trade in scale, decreases global biodiversity, and undermines the livelihoods of forest-dwelling people.

Unlike ivory or tiger pelts, the legality of timber products isn't easily assessed at first glance. As a result, illegally harvested timber is often passed off with a false identity or mixed in with shipments of legal wood. Because the DNA contained in any piece of wood may reveal its species and probable harvest location, the genetic identification of timber holds great potential to improve transparency in global supply chains. Nevertheless, these technologies rely on comprehensive libraries of genetic information against which to compare unknown samples.

Project Framework
Adventure Scientists volunteers will collect the leaves, seeds, cross-sections of wood, and tree cores from high-value, high-risk timber species. These samples will be used to build genetic reference libraries. We will offer these libraries to governments, nonprofits, and other global stakeholders, so that they may be used in concert with new-DNA sequencing technologies to disrupt tainted supply chains.

The pilot phase will begin with bigleaf maple, a towering hardwood that grows along the Pacific Coast of the United States and Canada. Because some bigleaf maples possess a sought-after wood pattern, these trees are currently targeted by timber thieves to supply the guitar and furniture trades. In 2018, Adventure Scientists will recruit, train, and manage volunteers including hikers, trail runners, sea kayakers, and others who will collect more than 1000 samples throughout the range of the species, which extends roughly from San Diego to Vancouver.

In future phases of this project, Adventure Scientists intends to create a comprehensive collection of reference material from other targeted, high-value timber species around the world.

Project Partners
New Mexico State University and **DNA4 Technologies** will share responsibility for DNA sequencing and data analysis. Their work will consist of two main steps: (1) use the tree samples to assemble reference databases for target species, and (2) test timber specimens against these databases to assess the accuracy and robustness of new identification tools. The Forest Legality Initiative at the **World Resources Institute** will coordinate the use cases of the project to ensure large-scale adoption and use of the data.

Project Timeline
1. Project infrastructure and protocols finalized (December – January 2017)
2. Project build and QA/QC review of protocols (February 2018)
3. Collection of bigleaf maple physical specimens (March – September 2018)
4. Lab analysis (DNA sequencing) of specimens (July – October 2018)
5. Publication of DNA reference libraries (Winter 2018 / 2019)
6. Project scaling both domestically and internationally (in future phases)

For more information:
Adventure Scientists is a 501(c)3 nonprofit organization that equips conservation partners with data collected from the outdoors that are crucial to addressing environmental challenges. By leveraging the skills of the outdoor adventure community, we are able to gather difficult-to-obtain data at any scale, in any environment.
Anya Tyson, Timber Project Manager, 719.231.2450, anya@adventurescientists.org

New Mexico State University's Conservation Genomics Lab focuses on identifying biological samples, particularly with respect to their geographic origin. We couple Next Generation Sequencing data with improved models of genetic differentiation across species' ranges to pinpoint the source of origin of timber and wildlife.
Brook Milligan, Professor and Manasse Scholar, 575.646.7980, brook@nmsu.edu

DNA4 Technologies is a biotech company developing computational tools that enable the identification of natural products. These tools build upon widely available and increasingly inexpensive Next Generation Sequencing methods to more accurately identify the species origin of natural products including sources such as food, nutraceuticals, and timber.
David Erickson, Founder, david@dna4tech.com

World Resources Institute is a global research organization that spans more than 50 countries and develops research-based solutions that create real change on the ground. WRI's work focuses on six critical issues at the intersection of environment and development: climate, energy, food, forests, water, and cities and transport. Their more than 700 experts and staff work closely with leaders to turn big ideas into action to sustain our natural resources—the foundation of economic opportunity and human well-being.
Meaghan Parker, Science Officer, Forest Legality Initiative, Forests Program, 202.729.7944, mparker@wri.org

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