DNA Barcode Scanner Project

Partners : Smithsonian Institution

World Wildlife Fund

Oceana

University of Washington

Background

- In 2015 Lumber Liquidators agreed to pay over $10 million USD for importing Mongolian Oak (*Quercus mongolica*)
  - Illegal logging in the area threatens many species, including Siberian tiger and Amur leopard
- A portion of this money is allocated for ‘Timber Identification Technology’
- Our timber identification technology project will address the need for a molecular field ID tool for timber samples
  - Will give border enforcement groups an on-site answer

Background - Challenges

- DNA concentrations are very low in heartwood
- Presence of inhibitory compounds also complicates analysis
- Barcode choice can vary per species
  - Assays will have to be developed on a per species basis
  - Plant barcoding is not as simple as animal barcoding…

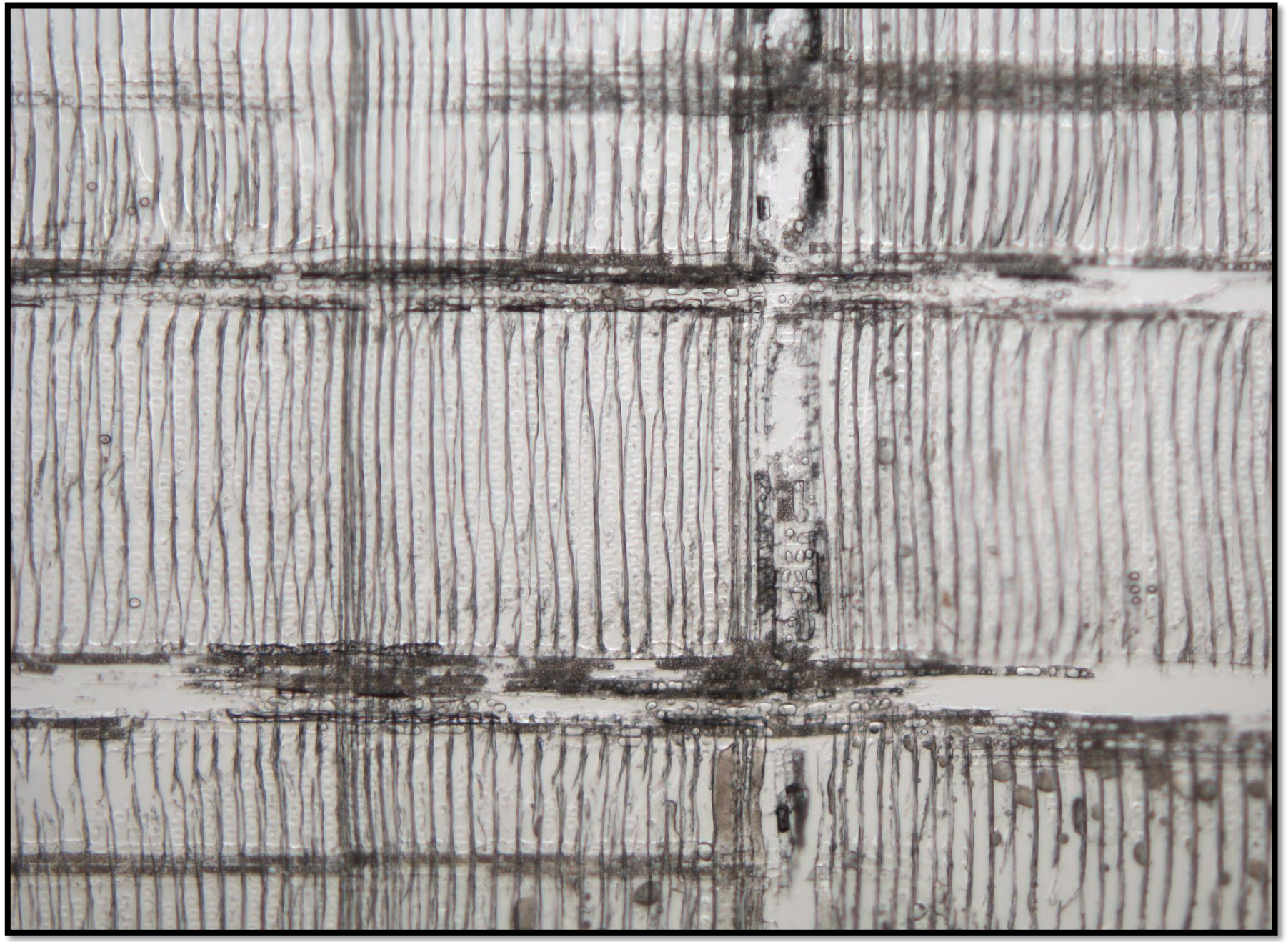
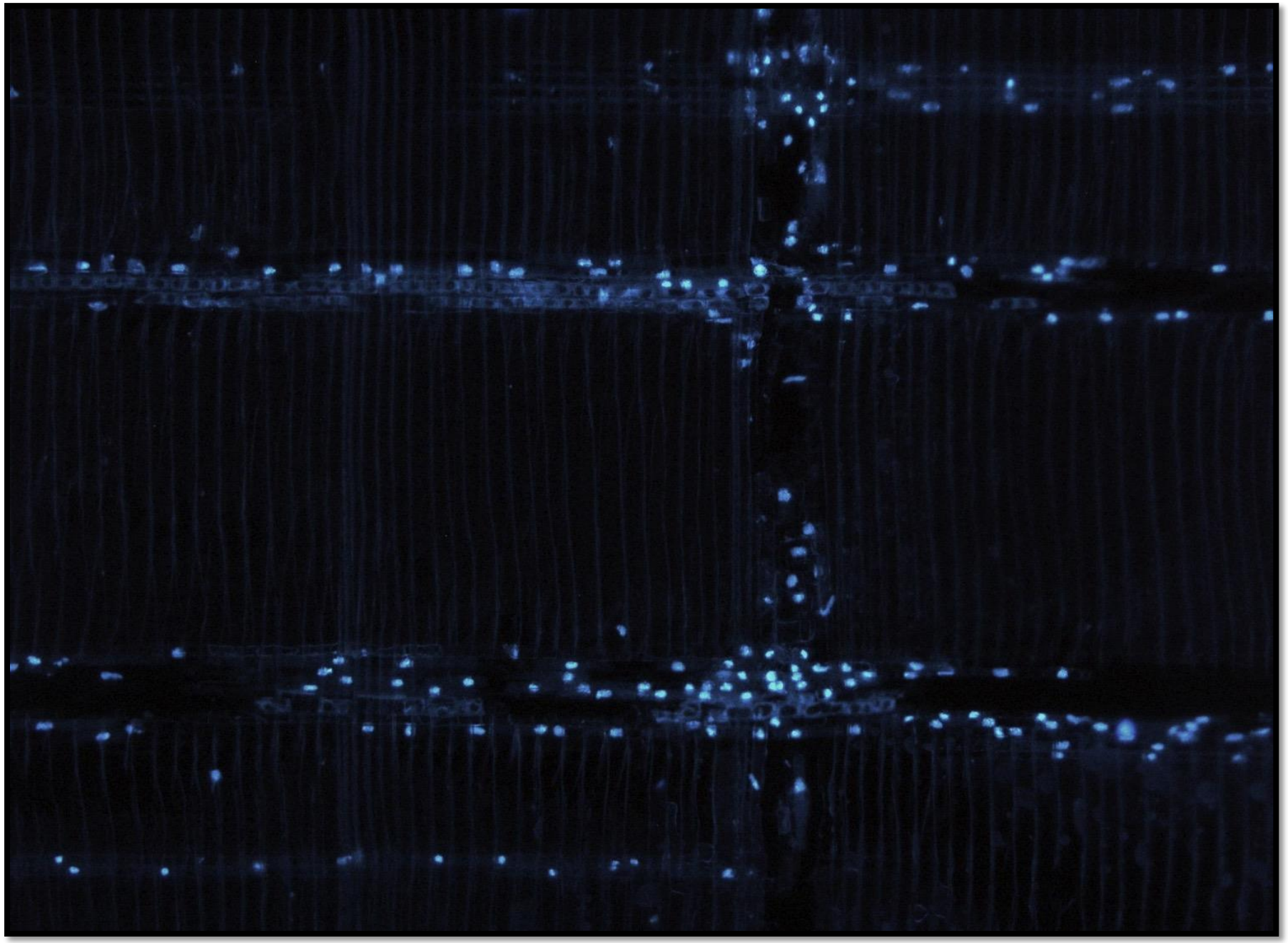


Photo courtesy of : Dr. Alex Wiedenhoeft – US Forest Products Lab USFS



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The Goal

- To create a **low cost**, **modular**, **portable** DNA barcode scanner, designed for the developing world, that can identify critical wood samples in the field to the genus and species level (and possibly region of origin) without access to taxonomic experts or a laboratory, coupled with a Barcode Library for endangered tree species used in trafficking

  - 1st Generation Device <$1500 USD : Sample Cost <$25 USD

The Goal

- To do this we will :
  - 1.) Develop DNA extraction methods for timber that are appropriate for field use
  - 2.) Identify and prototype amplification and analysis technologies in field-ready device
  - 3.) Improve design and reliability of technology to reduce cost and maximize field applicability/scalability

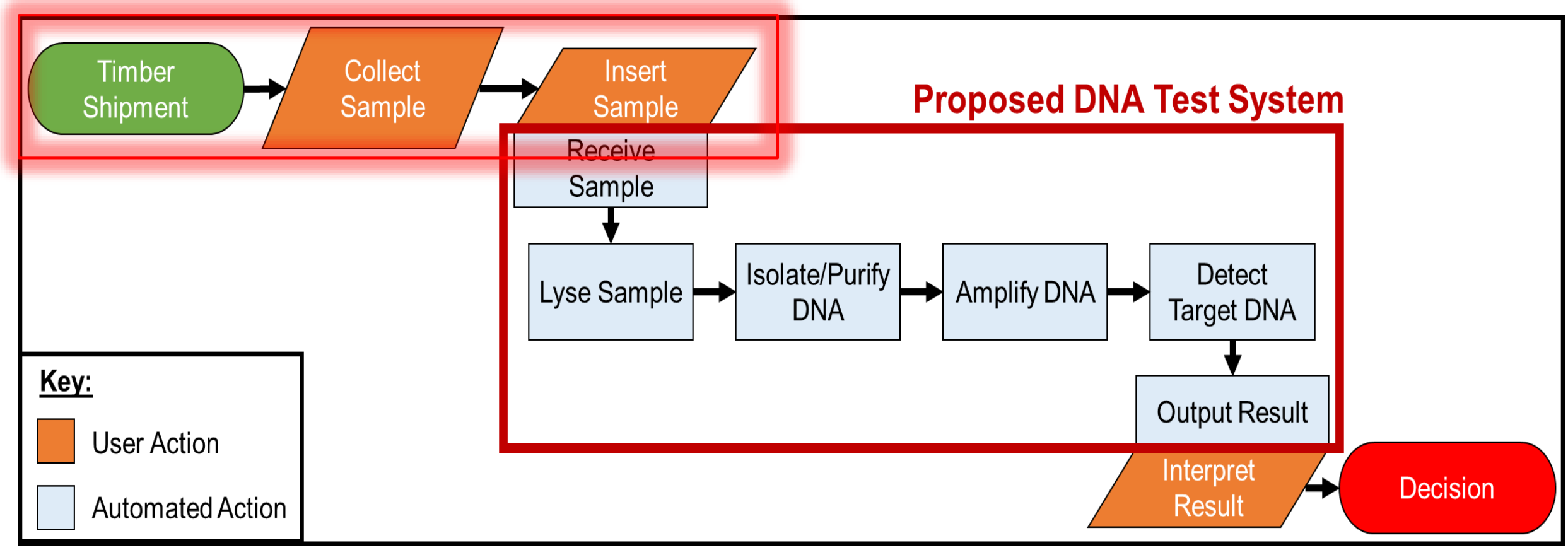
The Goal

- Capitalize on $3.0 billion USD market of point of care (POC) health diagnostic system DNA assay development
  - Devices deal with many of the same problems (low DNA concentrations, low resource settings)

- We are making a **decision support tool**, not a clinical device
  - This gives us access to *very* affordable technologies

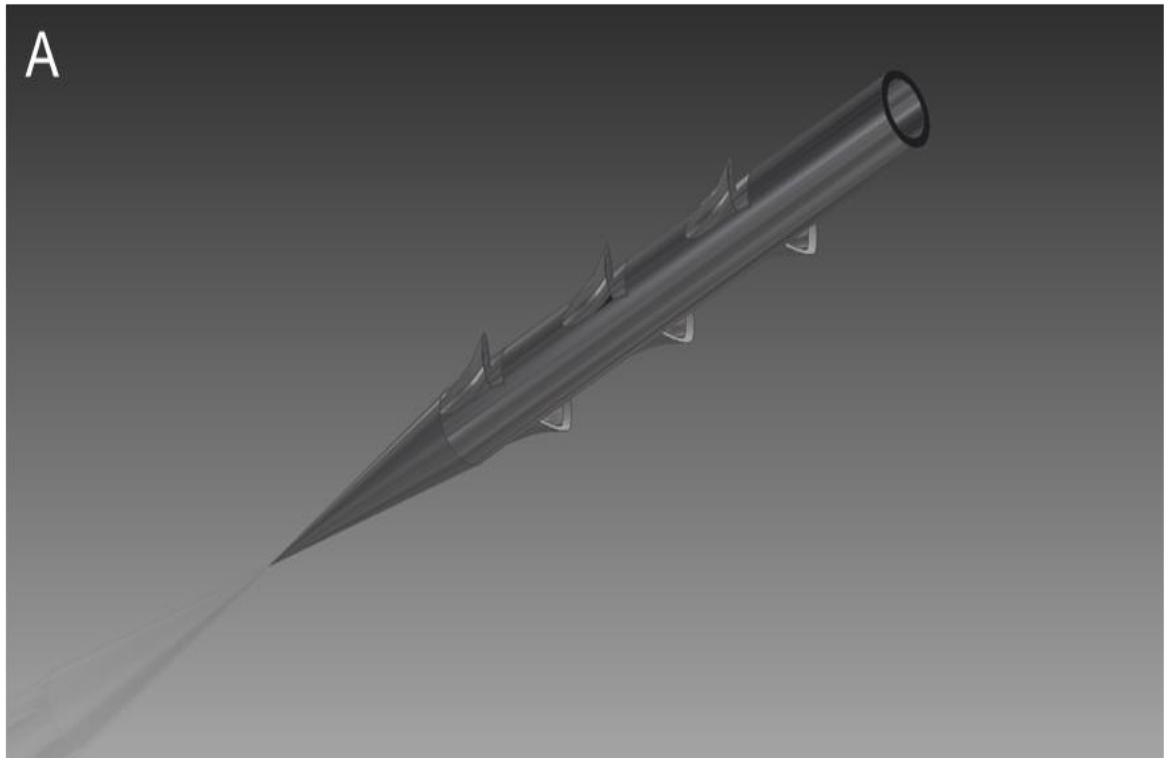
- August 2016 – Convening of experts from around the world
  - Identified many research pathways…

Timber DNA Barcoder : Microfluidic Prototype



Timber DNA Barcoder : Microfluidic Prototype

- Timber DNA Core Sampling Devices



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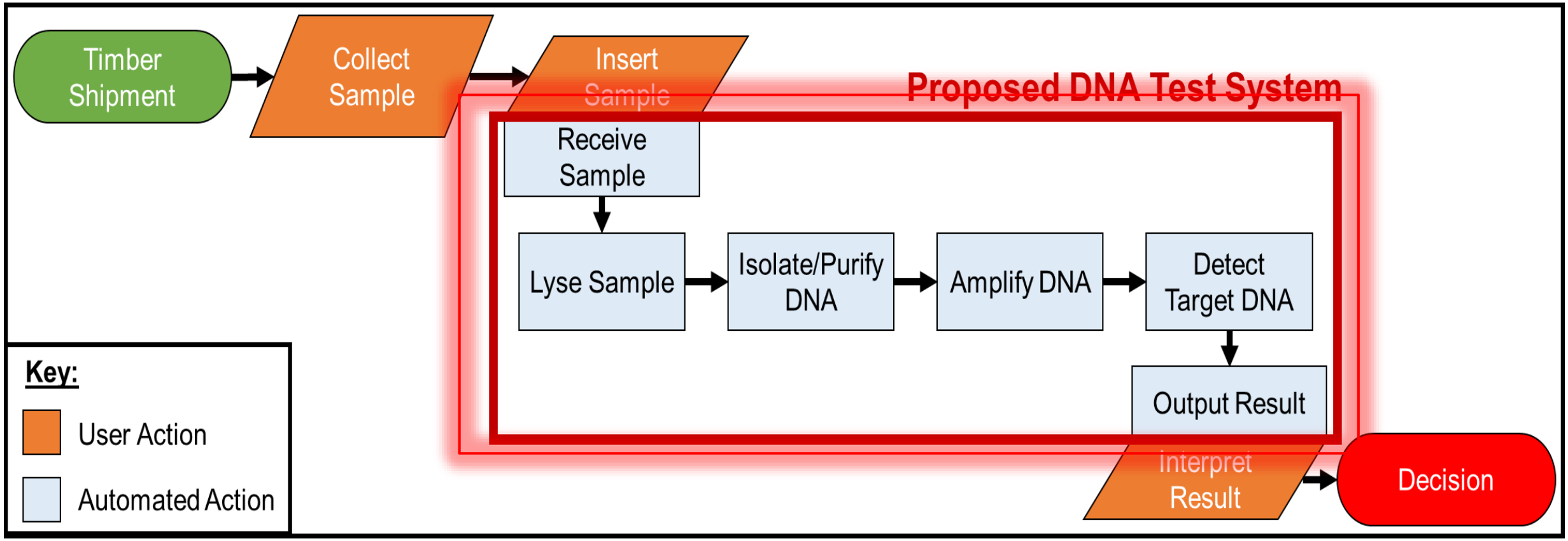


Timber DNA Barcoder : Microfluidic Prototype

- Microfluidic wafer technology manipulates small volumes of water for DNA extraction and analysis

Other technologies?

- MinION?
- Microarrays?
- Paper microfluidics?

- We are exploring these other options and will prototype 2 (hopefully 3) other devices by mid 2017

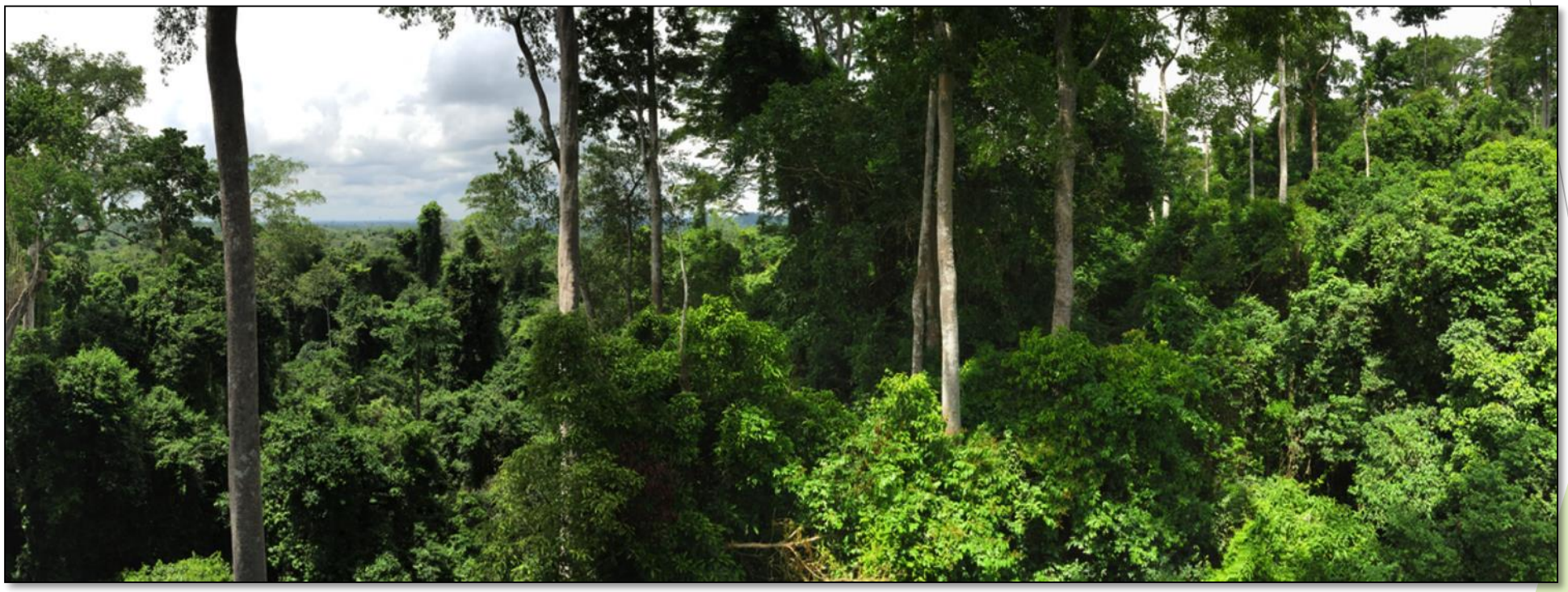
- We plan on field testing all of these technologies in our intended ecosystems by late 2017

Future work

- We are always looking to add collaborators. This is an open source project!

- How can you help?
  - Provide input on species of concern, design constraints, identification needs, etc.
  - Notify us of possible field locations to test prototypes
  - Share our progress with others in your fields

Questions?



- Feel free to contact me at : david@conservationxlabs.org