

The success of the Spectranomics Project rests upon the breadth and accuracy of a database derived from the collection of thousands of tree and liana species found throughout the humid tropical forest biome. Field collection and processing procedures are a critical step prior to the shipment of the samples back to our laboratory in Tempe, AZ.

The field procedures involve four steps:

- (i) *Site Preparation*: Locating, identifying and marking trees and lianas for collection.
- (ii) *Leaf Collection*: Acquisition of canopy foliage using climbing, pole-pruning, or shooting techniques.
- (iii) *Leaf Spectroscopy*: Measurement of leaf spectral properties using specialized field spectrometers.
- (iv) *Leaf Processing*: Mobile lab-based processing of leaves.

A basic description of each step is provided below.

### (i) Site Preparation

This essential step involves locating, identifying and marking trees and lianas for collection prior to the arrival of the spectranomics team. The goal is to identify and mark as many unique species as possible within and across sites. Each selected canopy **must** contain foliage in full sunlight positions in the canopy. This control is critical to ensuring that all leaves are chemically comparable between species and sites around the world. Candidate species should be accessible using tree climbing, pole-pruning or shooting techniques, depending upon resources and permitting.

### (ii) Leaf Collection

Leaf collections commence with Spectranomics personnel present on site, as only fresh foliage can be included in the spectroscopy and processing steps outlined below. A typical sample size should include about 25 g (dry wgt) of fully mature foliage. This usually equates to a large branch of leaves. Typically, a sample is removed from the canopy, keeping it in shaded conditions until it is delivered to the spectroscopist. The spectroscopist is usually stationed in or near the forest at a location

convenient to several (or ideally, many) species marked for collection. The spectroscopist is moveable as needed.

### (iii) Leaf Spectroscopy

Leaves are taken from freshly harvested branches. A subset is processed through a specialized, high-fidelity spectrometer. The spectrometer is field-portable, but not rain proof, therefore it is often set up under a tarp, in a tent, or in any available shelter at or close to the forest site. Spectral measurements take approximately 7 minutes per species. These spectral leaf samples, along with the remaining bulk sample, are packed in polyethylene bags and stored in standard coolers until delivered to the mobile lab. Typically, the field team can process 40-50 species per day, depending upon the speed of collection.

### (iv) Leaf Processing

The mobile lab consists of standard balances, scanners, laptops, drying ovens, and liquid nitrogen dewers. All equipment is brought in to and taken out of the country by the spectranomics team. A subset of leaves from each sample is prepared for freezing in liquid nitrogen dewers. These are specialized dewers certified for commercial air travel.

The bulk foliar sample is scanned for leaf area, weighed and oven dried at 60°C for 72 hours. The dry weight is then recorded. All dried foliage is packed in vacuum-sealed polyethylene bags for travel to the USA with the spectranomics team. A field voucher is collected during the leaf processing.

### Field and Mobile Lab Personnel

A typical two-week visit to a site should yield samples from at least 400 tree and liana species. However, we aim to collect as many species as possible, depending upon site diversity and sample accessibility. For a typical visit, 1 field-spectroscopy and 2-3 mobile-lab personnel are brought in from the Spectranomics Lab. Under certain circumstances, Spectranomics' tree climbers based in Peru will also provide climbing services and training to local climbers in other countries. In addition, we will temporarily employ a field botanist, local climbers/leaf collectors, and a field assistant. Typically, three to ten local students or volunteers are also included. We provide capacity building via on-the-job training and instruction.