



RAINFOREST CONNECTION

Nonprofit at the cutting edge of conservation technology.

We build and deploy scalable, open-source solutions for biodiversity and illegal activity detection in threatened ecosystems around the world.

Local solutions that power a global acoustic network.

Real-time acoustic sensors stream data to the RFCx platform, where Deep Learning AI is utilized for analysis in order to monitor biodiversity and destructive activities (illicit logging, mining, poaching, etc.).

Our combination of real-time monitoring stations and the RFCx platform will result in **the world's largest collection of soundscapes in which biodiversity will be tracked historically and in real-time across the most remote and important locations around the world.**



Threat Detection

RFCx picks out sounds of destructive activities, such as chainsaws, vehicles, dog barks and gunshots from the soundscape. Once the activity is identified, real-time alerts are sent to local partners on the ground via a Ranger Mobile App or collected to be used as forensic evidence.

This solution is effectively being utilized around the world to **halt illegal logging, poaching, mining and more.**

A black monkey is perched on a tree branch in a dense, sun-dappled forest. The monkey is looking towards the camera with a neutral expression. The background is filled with vibrant green leaves and branches, creating a sense of a healthy, thriving ecosystem.

Biodiversity Monitoring

RFCx acoustic sensors and analytical platforms monitor biodiversity in real-time. This technology has been used to automate species identification of thousands of species, and provides tools that make it easy to add models for thousands more.

This holistic biodiversity monitoring solution is used to empower local partners, researchers, and citizen scientists to better understand and conserve ecosystems. Ecoacoustics analyses are executed using a combination of RFCx offline and online recording devices.

RFCx SOLUTIONS

PROJECT-SPECIFIC SOLUTIONS FOR
MONITORING BIODIVERSITY AND HALTING
ILLEGAL ACTIVITIES

HARDWARE

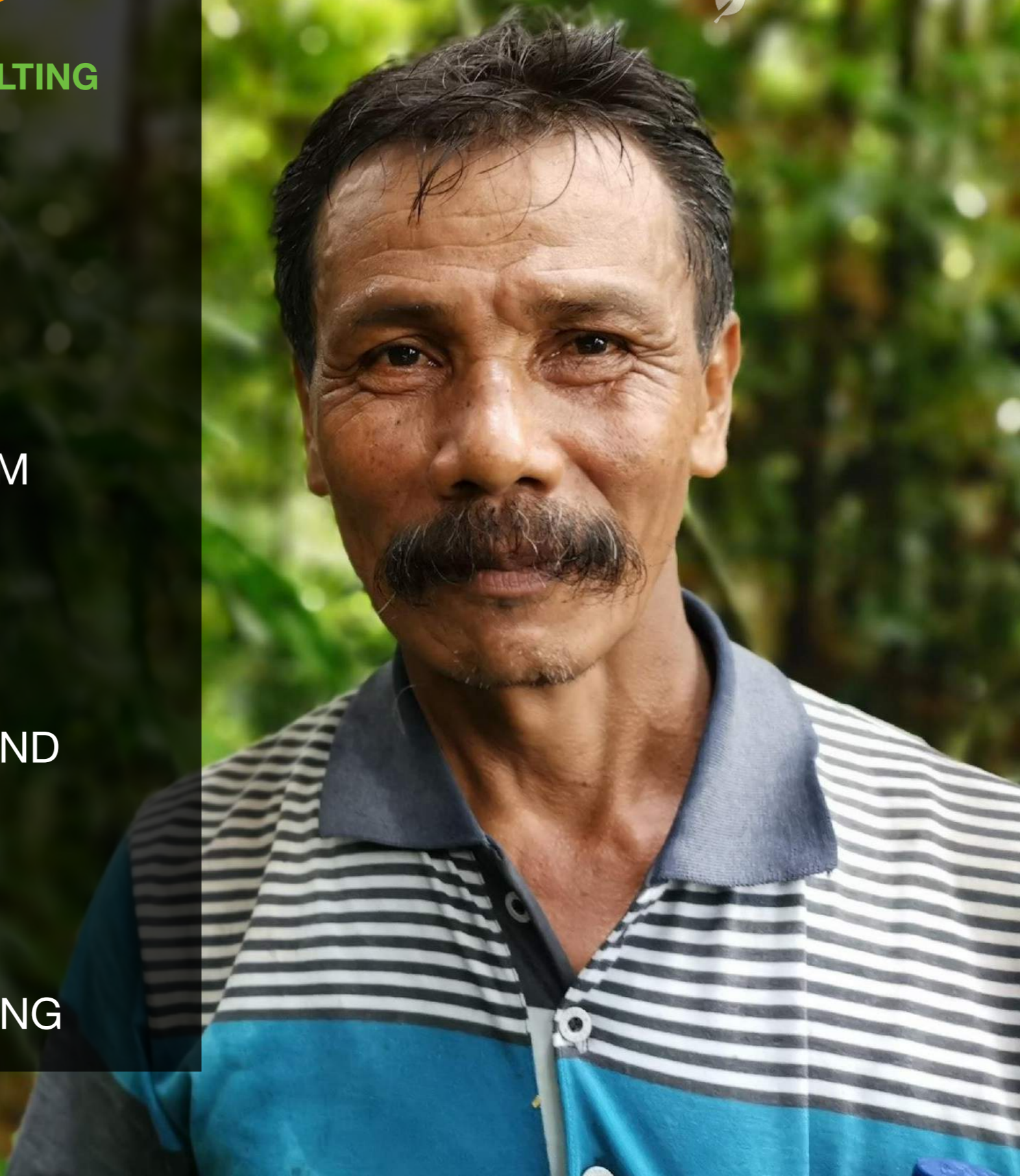
- GUARDIAN
- EDGE

SOFTWARE

- THREAT MONITORING SYSTEM
- ARBIMON
- EXPLORER

SERVICES

- SCIENTIFIC DATA INSIGHTS AND
REPORTS
- SURVEY DESIGN AND
IMPLEMENTATION
- DATA ANALYSIS
- MACHINE LEARNING MODELING



Guardian: Online

These are connected devices continually streaming acoustic data to the cloud. They provide permanent, continuous, real-time monitoring capabilities.

Guardians consist of a custom board, weatherproof box, directional antenna, microphone, and solar panels specifically adapted to collect the flecks of light that make their way through the forest canopy.



Edge: Offline

A low-cost, full-spectrum acoustic logger that can listen for sound from audible frequencies well into ultrasonic frequencies, recording uncompressed audio to micro SD cards. They are extremely easy to install, can be configured by an app, and can be used and moved by non-technical people on the ground.

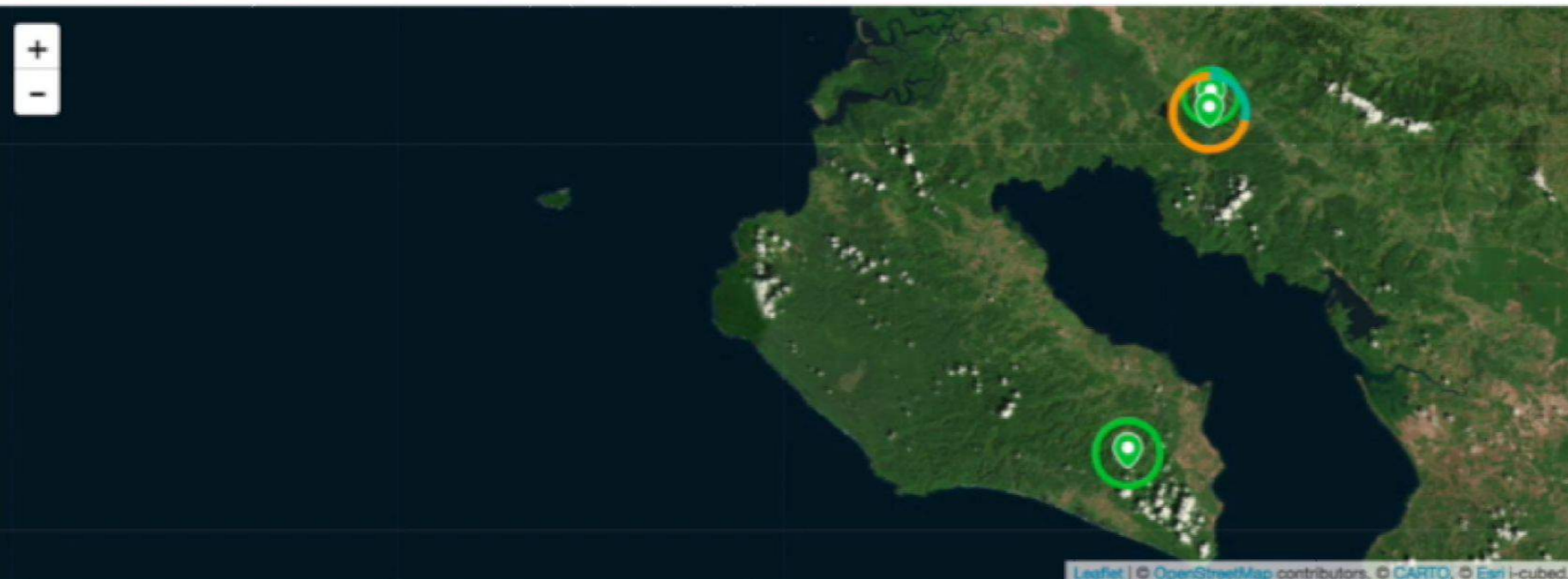
These devices are used for in-depth short-term biodiversity assessments.

THREAT MONITORING SYSTEM

The first real-time solution to large scale threat detection.

INCIDENT LOCATION & FREQUENCY

Supayang, S... All guardians All incidents Last 2 weeks



9:15 86%

Hi, Bourhan! Not tracking

Osa Conservation

YOUR WEEKLY STATUS

1	0	0
alert reviewed	reports submitted	minutes on duty

RECENT ALERTS

- Rio Tigré**
November 18, 2019 09:17
- Lomas - Este**
November 18, 2019 09:15

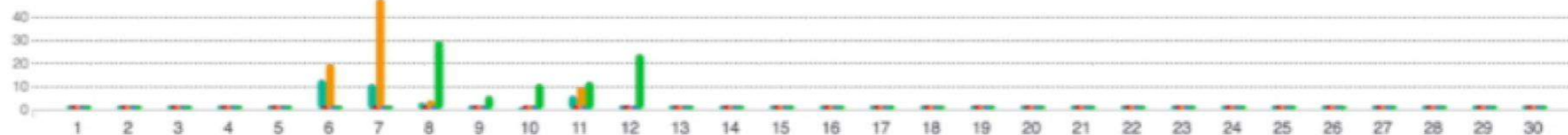
Lomas - Este
November 18, 2019 09:15

[FOLLOW UP LATER](#) [OPEN MAP](#)

BREAKDOWN BY INCIDENT TYPE

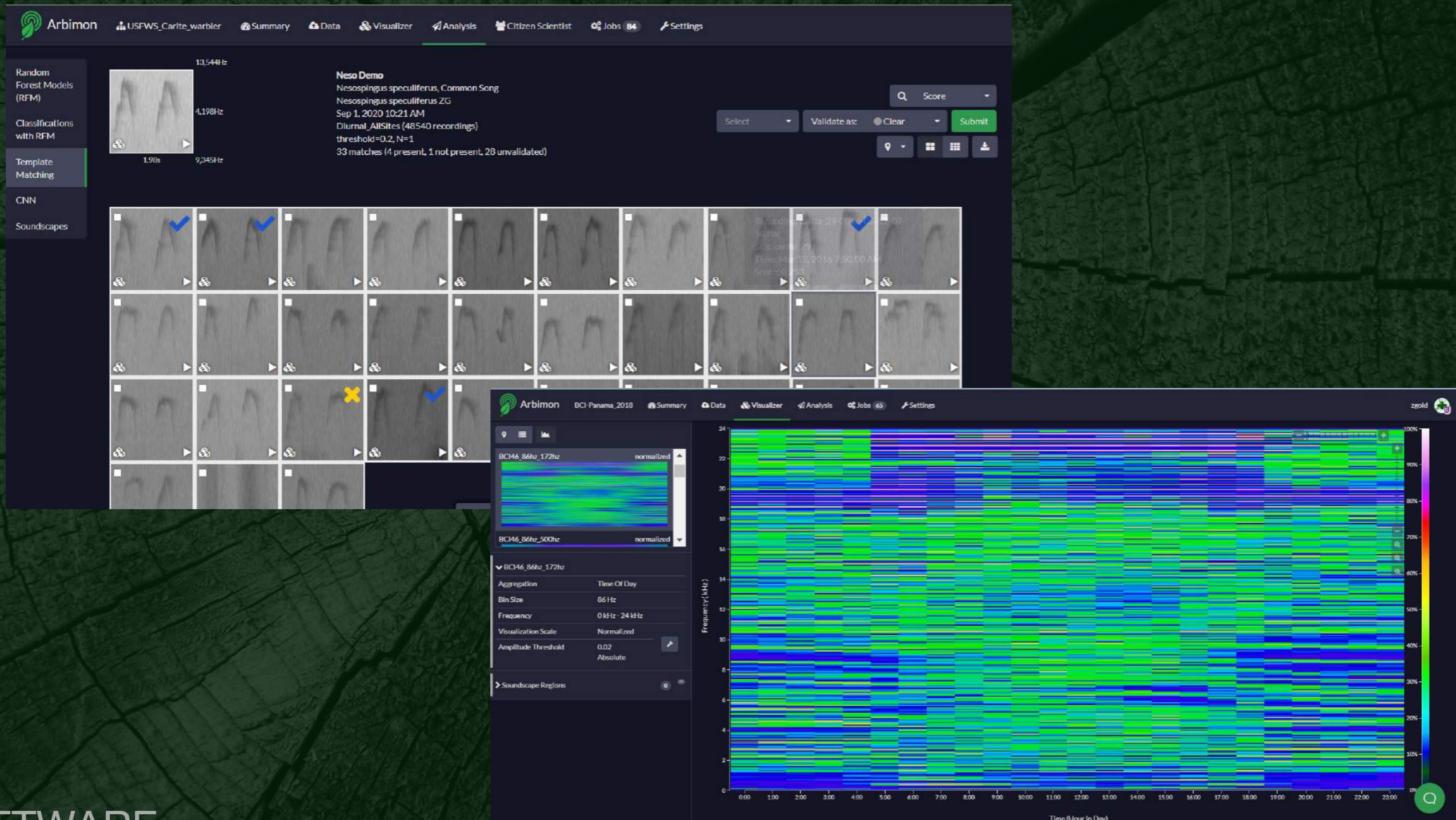
Vehicle Shot Chainsaw Amazon Parrot Macaw

Jun 2018



ARBIMON

Arbimon allows for fast and easy data labeling using pattern recognition. These models can be used for in-depth analyses and then translated into species-specific or multi-species CNN models.



EXPLORER COMING SOON



The most advanced online interface for ecoacoustics studies in order to monitor ecosystem health and catalyze new ecological discoveries using AI.

The screenshot displays the Rainforest Connection Explorer interface, which is designed for monitoring ecosystem health through ecoacoustics. The interface is divided into several key sections:

- Map:** A world map showing the location of streams. The North Atlantic Ocean is highlighted.
- Streams List:** A list of streams with details such as name, date, and location. Examples include "Spider Monkey Audio" (2020/05/15), "Audio Test Files" (2020/05/15), and "Test_lvette_ea7b" (2020/01/08).
- My Stream Activity:** A section showing uploads, frequent labels (chainsaw, vehicle, monkey), and a verified detections rate of 10%.
- Labels:** A section for user-generated labels, with a note that sounds tagged in streams will appear here.
- Detections:** A section showing detected species, including Cicadas (120 detections) and Monkey (12 detections), with verification options.
- Audio Player:** A section for playing audio files, showing the file name "Spider Monkey Audio - Prod", the date "2019 8 24", and a play button.
- Creating Annotations:** A section for creating annotations, showing a spectrogram of the audio file with a "DONE" button.
- All Annotations:** A section for viewing all annotations, including "Spider Monkey", "Orca", "Unspecified", "Echolocation", and "Call".

Scientific Analysis

The RFCx team includes PhD conservation biologists with decades of experience using acoustics to monitor species for conservation. They specialize in creating models to analyze the acoustics of regions to extract important insights.

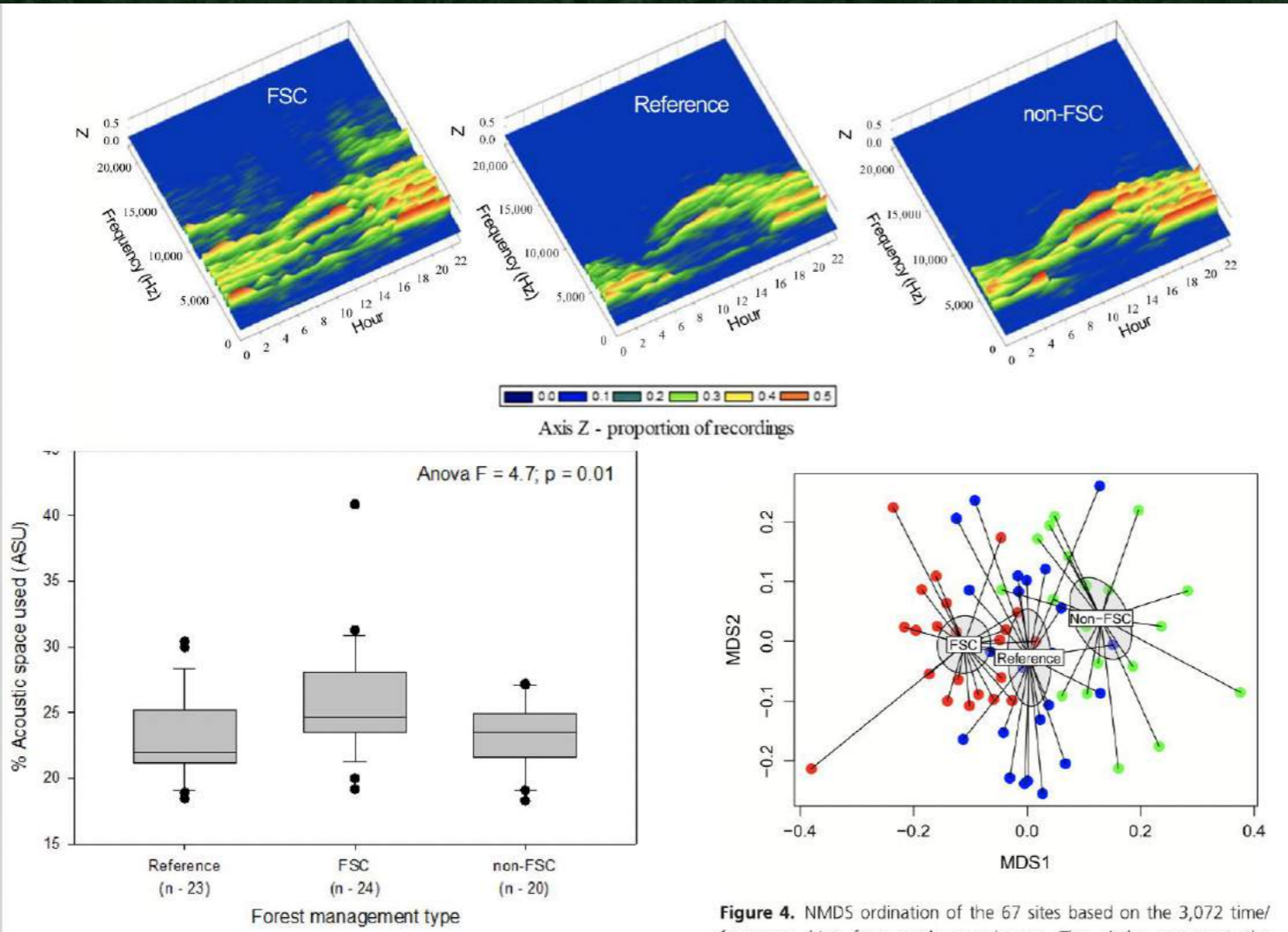
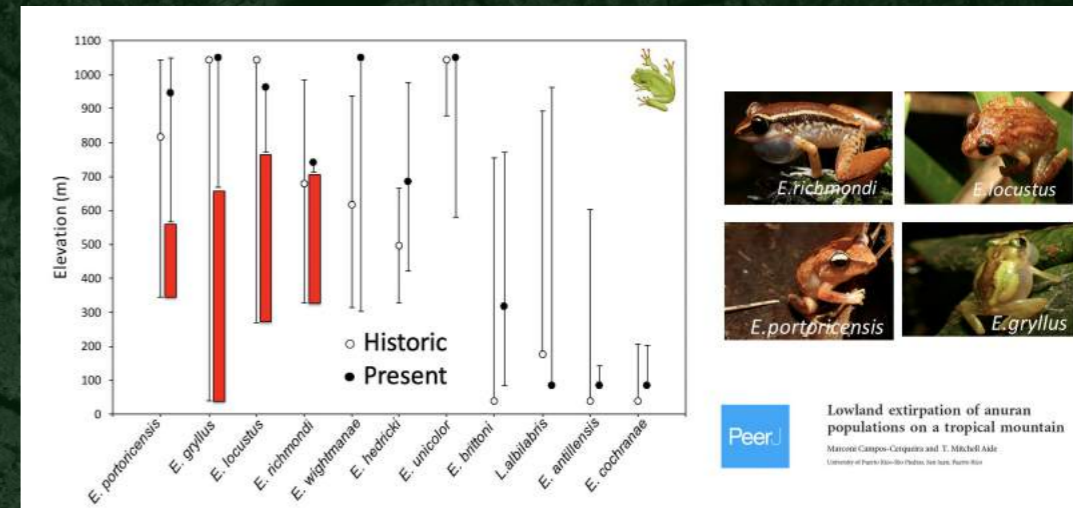


Figure 2. Boxplot of the percent of acoustic space used in the three management types.

Figure 4. NMDS ordination of the 67 sites based on the 3,072 time/frequency bins from each soundscape. The circles represent the standard error (95%) around the centroid for the three management types.



Soundscape Analyses

Functioning model of 11 frog and 15 bird species from Puerto Rico

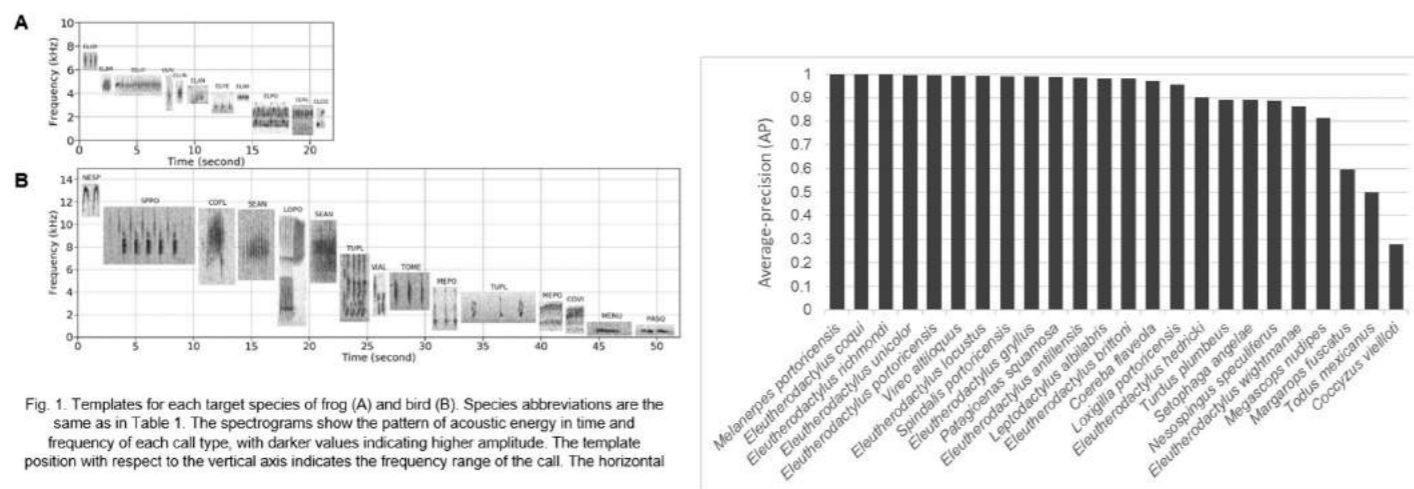
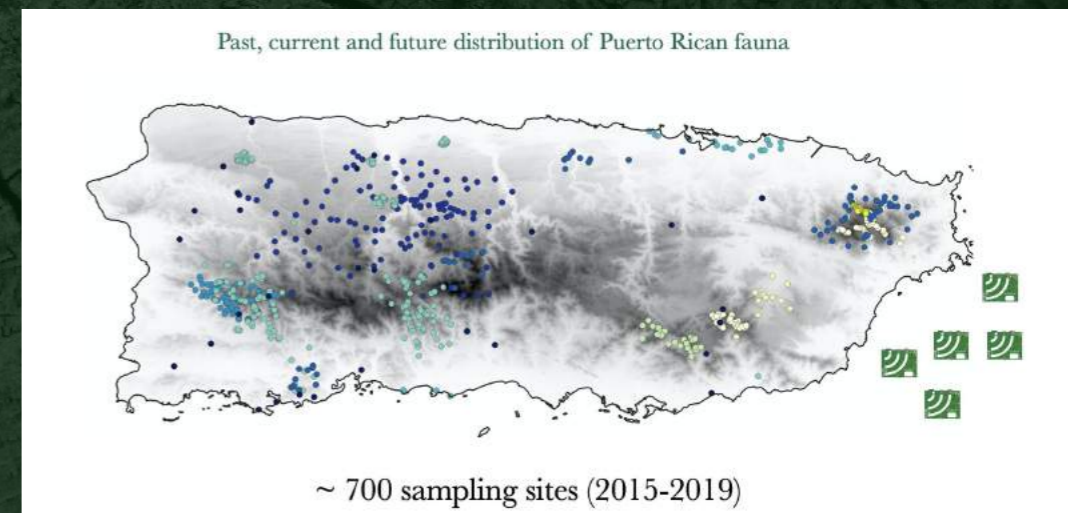


Fig. 1. Templates for each target species of frog (A) and bird (B). Species abbreviations are the same as in Table 1. The spectrograms show the pattern of acoustic energy in time and frequency of each call type, with darker values indicating higher amplitude. The template position with respect to the vertical axis indicates the frequency range of the call. The horizontal



Species Distribution Mapping

Multi-Species Modeling

SCIENTIFIC DATA INSIGHTS & REPORTS

RFCx offers peer-reviewed quality manuscripts, with work published in over 100 peer-reviewed high-level international conservation journals.



2019



How does FSC forest certification affect the acoustically active fauna in Madre de Dios, Peru?

Campos-Cerqueira M, Aide, TM

2019



Using soundscapes to assess biodiversity in Neotropical oil palm landscapes

Furomo PR, Aide, TM


2018



It's time to listen: there is much to be learned from the sounds of tropical ecosystems

Deichmann JL, Acevedo-Charry O, Barclay L, Burivalova Z, Campos-Cerqueira M, d'Horta F, Game ET, Gottesman BL, Hart PJ, Kalan AK, Linke S, Nascimento LD, Pijanowski B, Staatterman E, Aide TM

2017



Changes in the acoustic structure and composition along a tropical elevational gradient

Campos-Cerqueira M, Aide, TM

Survey Design and Implementation

Develop and maintain long-term acoustic surveys that enable efficient and effective monitoring of biodiversity, creating measurable conservation best practices.

Data Analysis

Ability to store, visualize, and analyze large acoustic datasets.

Machine Learning Models

New models can be created utilizing RFCx's technology, AI experts, and network of data scientists.



Today, RFCx has initiated projects in **38** countries across **6** continents.

