Evaluating tropical dry forests responses to degradation based on the sounds of nature

Colombia: 1947 bird species
Goal:
Evaluate changes in biodiversity along gradients of landscape transformation and succession.
STUDY SITES
transformation
succession
early, interm, late
low, interm, high
transformation

SAMPLING DESIGN

Class
- High
- High high
- High low
- High med
- Low
- Low high
- Low low
- Low med
- Med
- Med high
- Med low
- Med med
90 sampling locations across 9 study sites
WHAT'S BIOACOUSTICS?
WHY BIOACOUSTICS?

- passive, cost-effective monitoring tool
- easy sampling over large temporal & spatial scales
- expected to be related with ecosystem functioning and landscape health
To which extent does the soundscape of a forest reflect landscape transformation levels?
19 indices of acoustic diversity

complexity & variability

Schedule:
5 min - ON 5 min OFF;
5 days ON - 5 days OFF
1 month.

sampling rate: 48kHz; Bit depth: 16
RESULTS

Acoustic diversity index (≈ Shannon Index)
Median amplitude envelope (relative to avian abundance)
Root mean square (complexity measure)
RESULTS

NMDS based on all indices

axis 1
axis 2

site 1 (high)
site 2 (interm.)
site 3 (interm.)
site 4 (low)
site 5 (low)
site 6 (low)
RESULTS

NMDS based on spectral signatures
RESULTS

NMDS based on spectral signatures
important idiosyncracy

acoustic indices: unable to differentiate landscape transformation levels

ordination methods based on the spectral signatures of the soundscape perform better...

BUT biological interpretation not intuitive

way forward: time series analyses & classification methods

→ big challenge
Thank you!