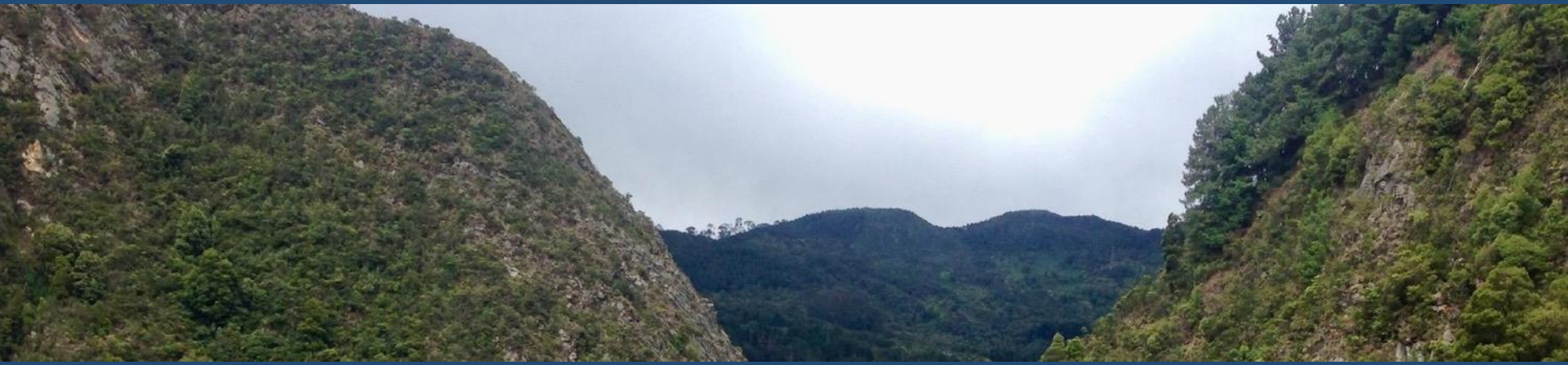
American Museum of Natural History

Center for Biodiversity and Conservation

A.39 Advancing tools for an integrated biodiversity monitoring system for Colombia's protected areas



NASA

PARQUES NACIONALES NATURALES DE COLOMBIA

INSTITUTO HUMBOLDT COLOMBIA

TEMPLE UNIVERSITY

GEO BON

Project team, collaborators (in alphabetical order):

Alan Aguia (SINAP)
Mary Blair (AMNH)
Angela Castañeda (SINAP)
Luisa Corredor (SINAP)
Cristian Cruz (von Humboldt Institute)
Bibiana Gomez (von Humboldt Institute)
Liliana Gualdron (SINAP)
Victor H.Gutierrez (Temple University)
Patrick Jantz (Northern Arizona University)
Maria C. Londoño (von Humboldt Institute)
Daniel Lopez (AMNH)
Angela Mejía (Temple University)
Elkin Noguera (von Humboldt Institute)
José M. Ochoa (von Humboldt Institute)
Ivan Posada (SINAP)
Jeronimo Rodriguez (Temple University)
Victoria Sarmiento (Temple University)
Erika Suarez (von Humboldt Institute)
Camilo Zapata (von Humboldt Institute)
Diego Zarrate (ProCat/WWF)

American Museum of Natural History

Center for Biodiversity and Conservation

NSF
NASA
GEOBON
MINAMBIENTE
HUMBOLDT COLOMBIA
TEMPLE UNIVERSITY
PACE UNIVERSITY
GBIF
UCONN
PARQUES NACIONALES NATURALES DE COLOMBIA
BioModelos
The City University of New York
The City College of New York
NAU
BON IN A BOX
REGIÓN LATINOAMÉRICA

Background

- Colombia is the second most biodiverse country in the world and is therefore of strategic importance for global conservation efforts.

- Colombia is also home to some of the rarest and most highly threatened ecosystems in the world including paramo and tropical dry forest, which are experiencing even greater threat due to recent surges in land conversion rates.

Project Motivation & End User Need

- Colombia has made important progress in the use of Earth Observations, processing tools, and information systems for monitoring change in ecosystems and species in the last decades.

- Yet, the integration of existing capabilities into an integrated biodiversity monitoring system can improve access to up-to-date biodiversity indicators for timely decisions on biodiversity conservation.

NASA A.39 Integrated Biodiversity Monitoring System

Goal:

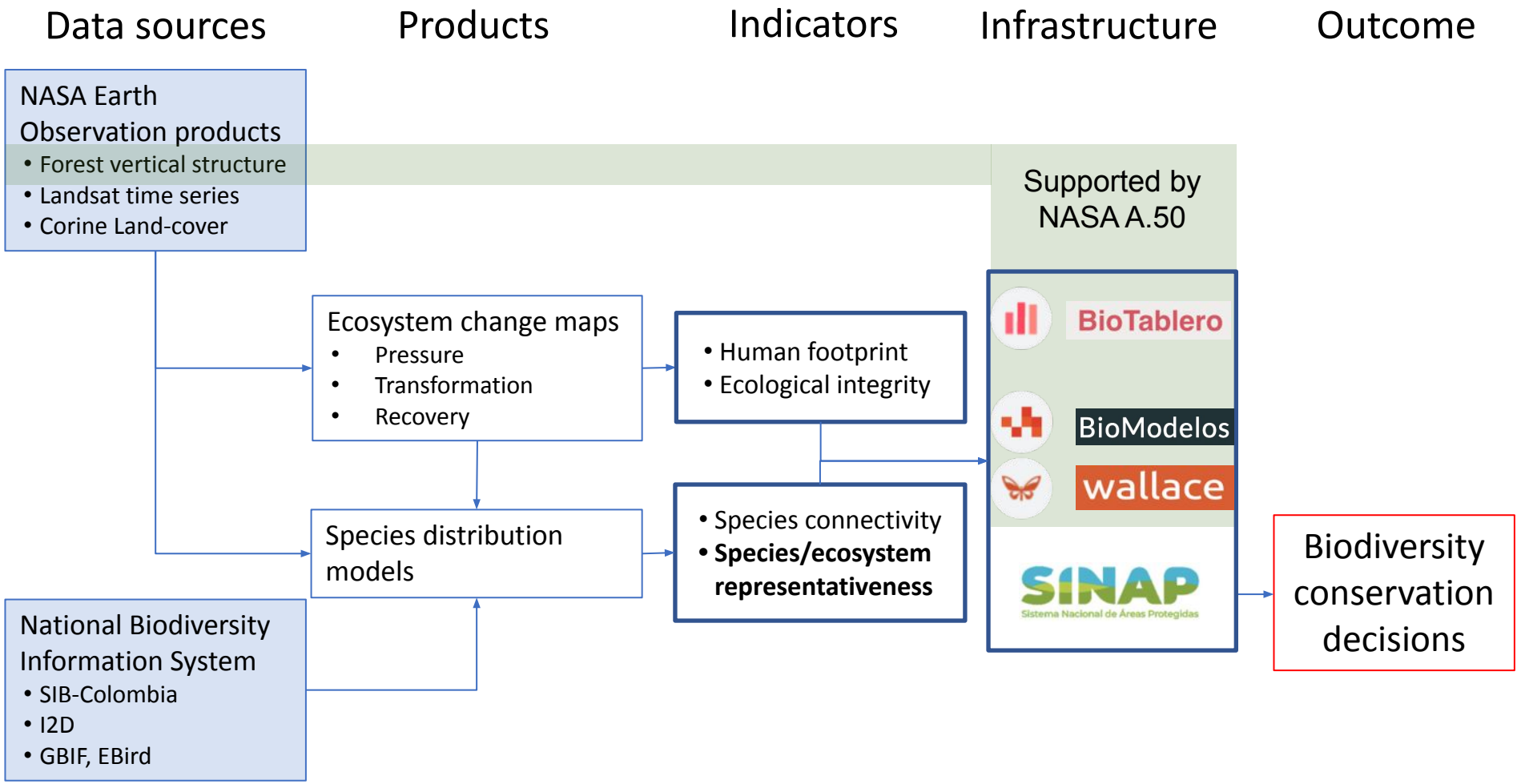
- *To support the implementation of a dynamic biodiversity monitoring system that integrates available processing tools and Earth Observation capabilities for biodiversity decision-making in Colombia.*

Objectives

We are leveraging existing modeling and information capabilities from three previously funded NASA A.50 projects in Colombia to:

- Expand technical capabilities for the integration of Earth Observation Products into Biodiversity Conservation Indicators

- Integrate existing workflows to facilitate timely access to biodiversity indicators for decision-making.


Data sources
Products
Indicators
Infrastructure
Outcome
NASA Earth Observation products
• Forest vertical structure
• Landsat time series
• Corine Land-cover
National Biodiversity Information System
• SIB-Colombia
• I2D
• GBIF, EBird
Ecosystem change maps
• Pressure
• Transformation
• Recovery
Species distribution models
• Human footprint
• Ecological integrity
• Species connectivity
• Species/ecosystem representativeness
Supported by NASA A.50
BioTablero
BioModelos
wallace
SINAP
Sistema Nacional de Áreas Protegidas
Biodiversity conservation decisions

Decision-making element(s)

- PNN-SINAP & Colombia BON produce and use biodiversity indicators for decision-making:
  - **Declaration of new areas** based on representativeness of species and ecosystems
    - CONPES 4050 & SINAP 2020-2030
    - National Development Plan (PND)
      - Representativeness of species and protected ecosystems in PAs
      - Human footprint change in PAs
  - **Monitoring & Evaluation** of the outcomes of conservation efforts
    - National management plans & monitoring programs
    - CBD COP15 Agreements and Reporting for COP16
  - Identification of **priority species**
    - CONPES 4058
      - Species vulnerable to climate change and priority species

Current activities, progress and next steps:

Activity
Integration of Earth Observation products for improved/automated ecosystem change assessment
New/improved inputs/outputs for producing biodiversity indicators
System development for timely access to biodiversity indicators

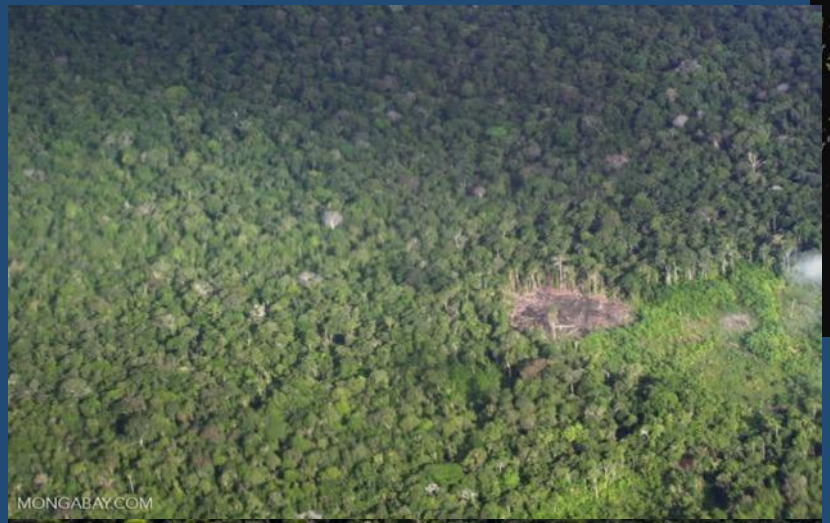
1. Improve land cover information with higher temporal and spatial resolution

2. Update and expand SIM-SINAP inputs to improve information for biodiversity indicator calculations (representativeness, connectivity)

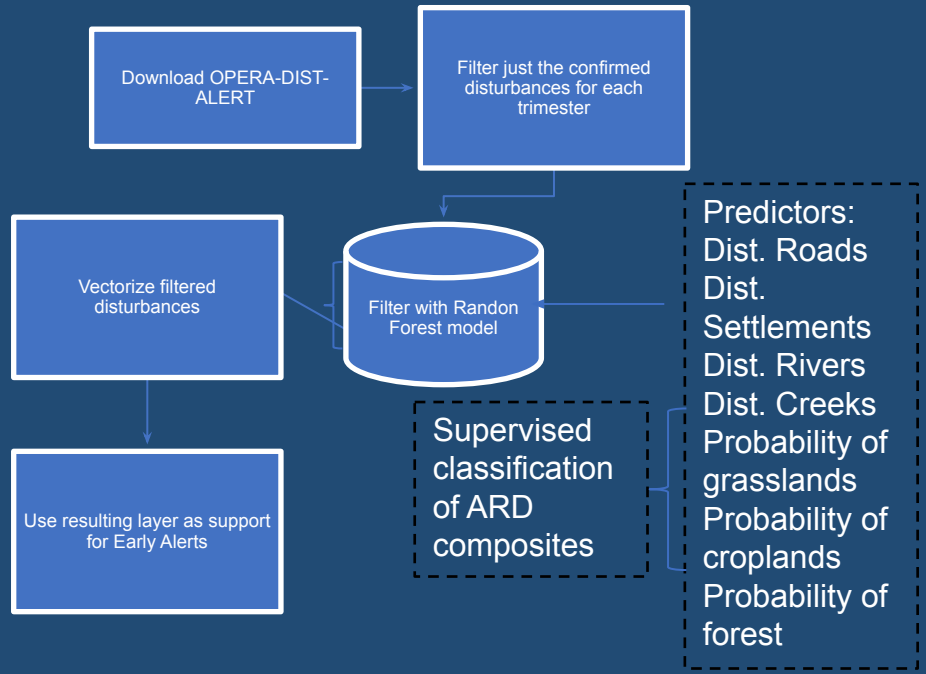
3. Develop biodiversity information system by connecting existing tools & improving interoperability

Current activities, progress and next steps:

Activity	Progress	Next steps
Integration of Earth Observation products for improved/automated ecosystem change assessment	● Completed analytical workflow & accuracy tested. Workflow refined, documented and shared with end-users. ● Completed additional analysis and workflow requested by end users to support their early alerts on ecosystem transformation with a new RS dataset (OPERA-DIST)	● Training materials and events for more complete and sustainable integration into end user operational systems after successful tests
New/improved inputs/outputs for producing biodiversity indicators		
System development for timely access to biodiversity indicators		



Juancho Torres / Anadolu Agency via Getty Images file
www.nbcnews.com



RESULTS

Calculated for Sierra Nevada de Santa Marta for 1st trimester of 2024

FILTERING DISTURBANCES

- Model had an overall accuracy of 0.80

After been tested for 3rd trimester of 2024 the National Park System reported that the support layer **improves the detectability** of disturbances

Current activities, progress and next steps:

Activity	Progress	Next steps
Integration of Earth Observation products for improved/automated ecosystem change assessment		
New/improved inputs/outputs for producing biodiversity indicators	• More than 8200 new species distributions completed, including marine species for the first time • Updated human footprint completed and a marine human footprint completed for the first time • Completed calculation of updated richness and connectivity indicators with new information	• Fill a few remaining gaps for high-priority PNN species • Update the portal information: https://sinap.parquesnacionales.gov.co/indicadores-nacionales
System development for timely access to biodiversity indicators		

Current activities, progress and next steps:

Activity	Progress	Next steps
Integration of Earth Observation products for improved/automated ecosystem change assessment		
New/improved inputs/outputs for producing biodiversity indicators		
System development for timely access to biodiversity indicators	• Pre-processing and other needs identified and addressed to enable the integration of updated inputs into the system (to complete the updated indicator calculations mentioned above) • Formal cross-institutional collaboration agreement among Colombian institutions (SIAC) to share and access inputs/outputs	• Strengthen the system with Docker (containers) and Cloud services. • System launch and training event

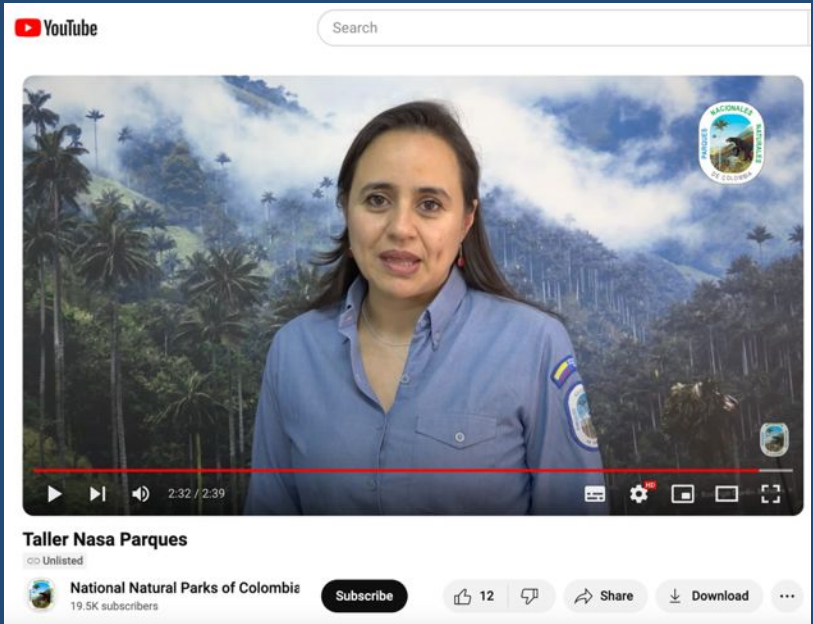

Montería, March 2023


Bogotá, June 2023


Santa Marta, March 2024
INVERTEBRADOS MARINOS
BioModelos
PECES MARINOS


PARQUES NACIONALES NATURALES DE COLOMBIA
Tienda de Parques

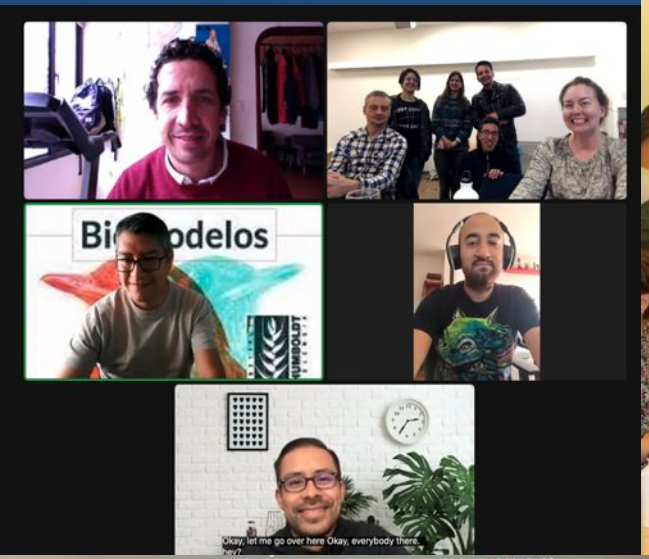
End User Video



- https://www.youtube.com/watch?v=4Yp4z5PgbWk

Challenges

- Personnel turnover in end-user organizations



Thank you!

mblair1@amnh.org

victorhugo@temple.edu

- Additional slides if helpful/for questions

End-user retreat/workshop

System input workshop

Project Schedule