



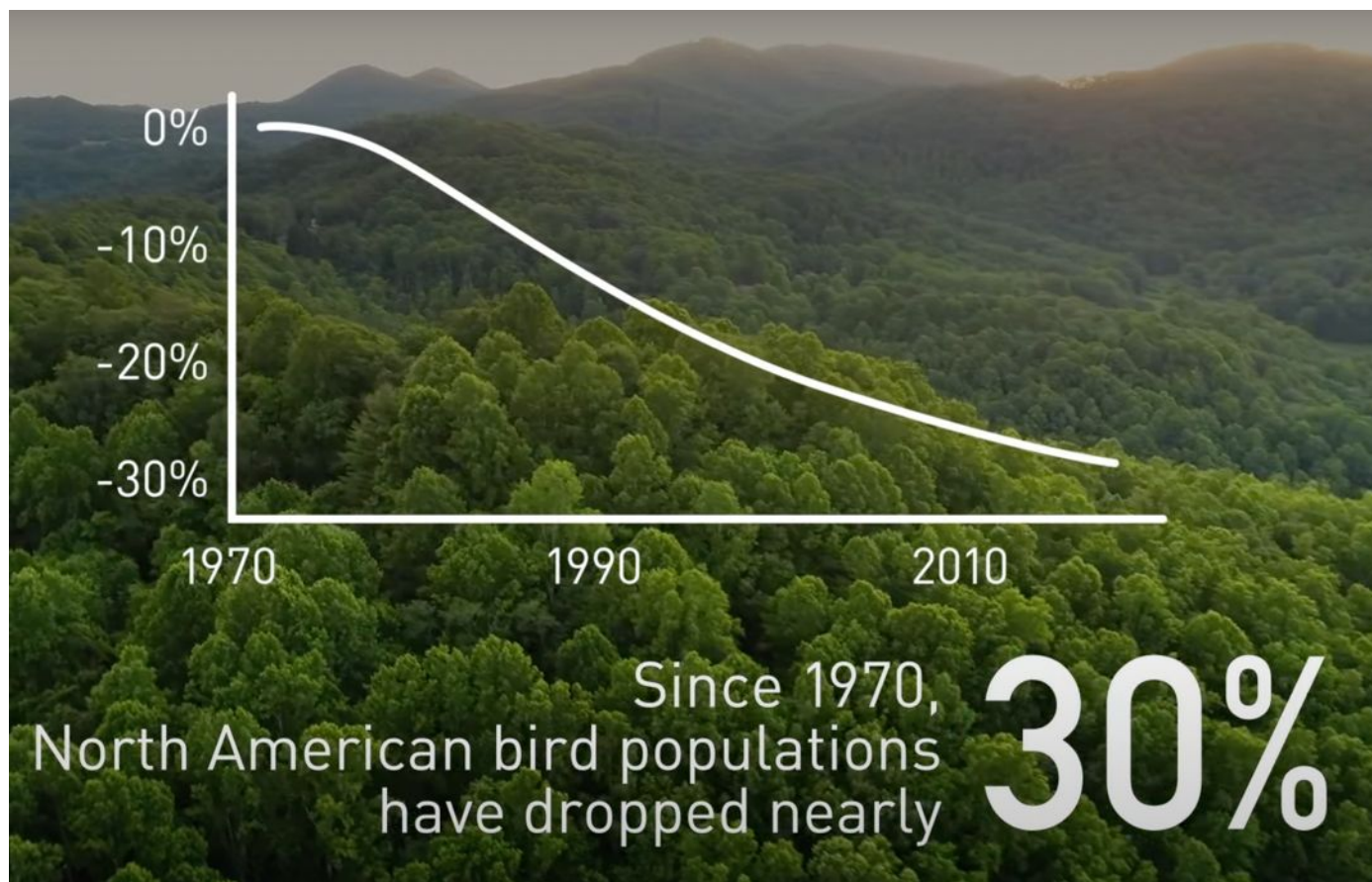
Maximizing the effectiveness of area-based conservation strategies for birds in Latin America under a changing environment

Jill Deppe
National Audubon Society

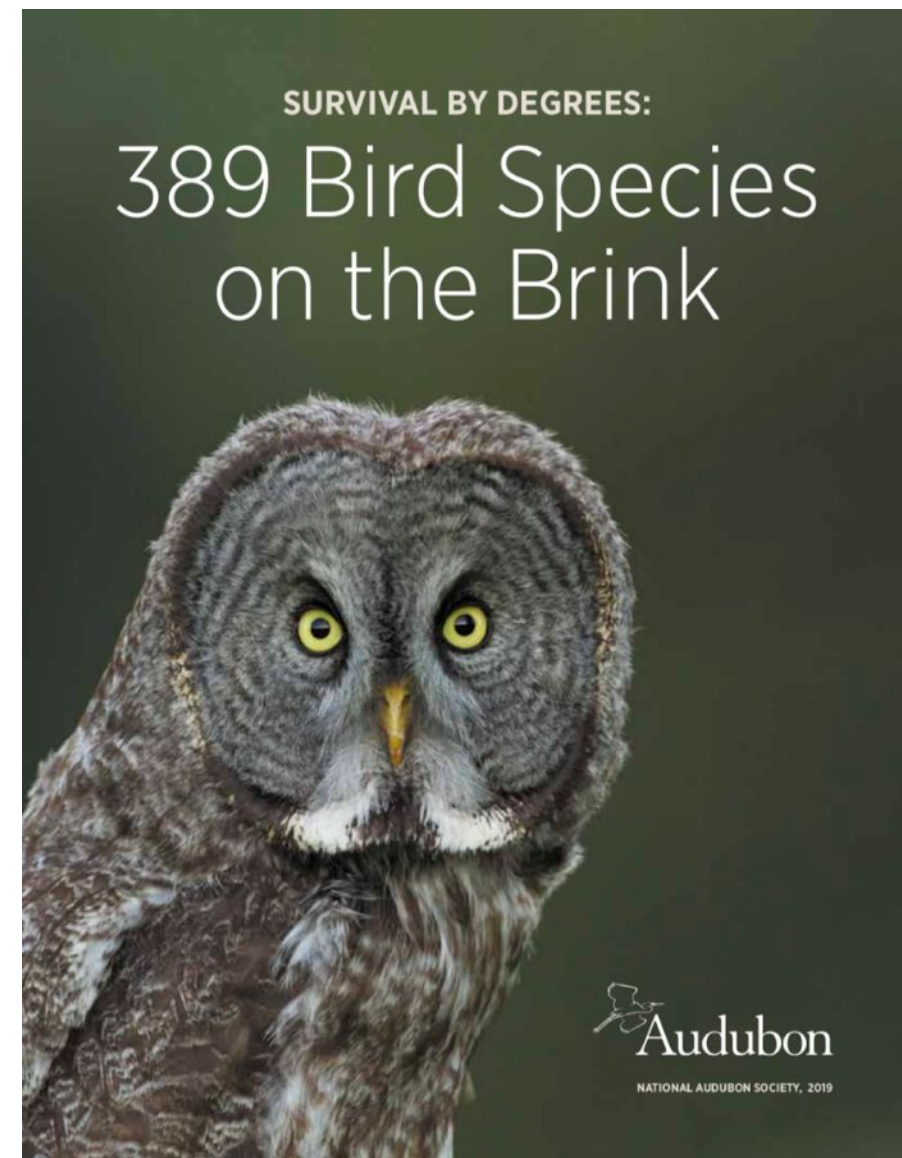


Black-throated Green Warbler. Photo: Joshua Galicki, Audubon Photography Awards

Birds are indicators of biodiversity loss and climate change



Rosenberg et al. (2019) *Science*



Bateman et al. (2020) *Conservation Science & Practice*

Conservation strategies that benefit birds, ecosystems & people today and in the future



Environmental Benefits

- Improved water quality
- Increased biodiversity contribution
- Improved carbon sequestration
- Decreased erosion

Socioeconomic benefits

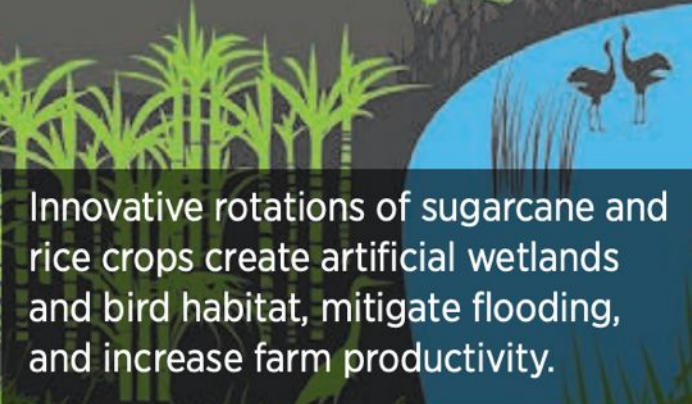
- Increased yields (crops and animals)
- Increased profitability
(average annual income growth of more than 10 percent)



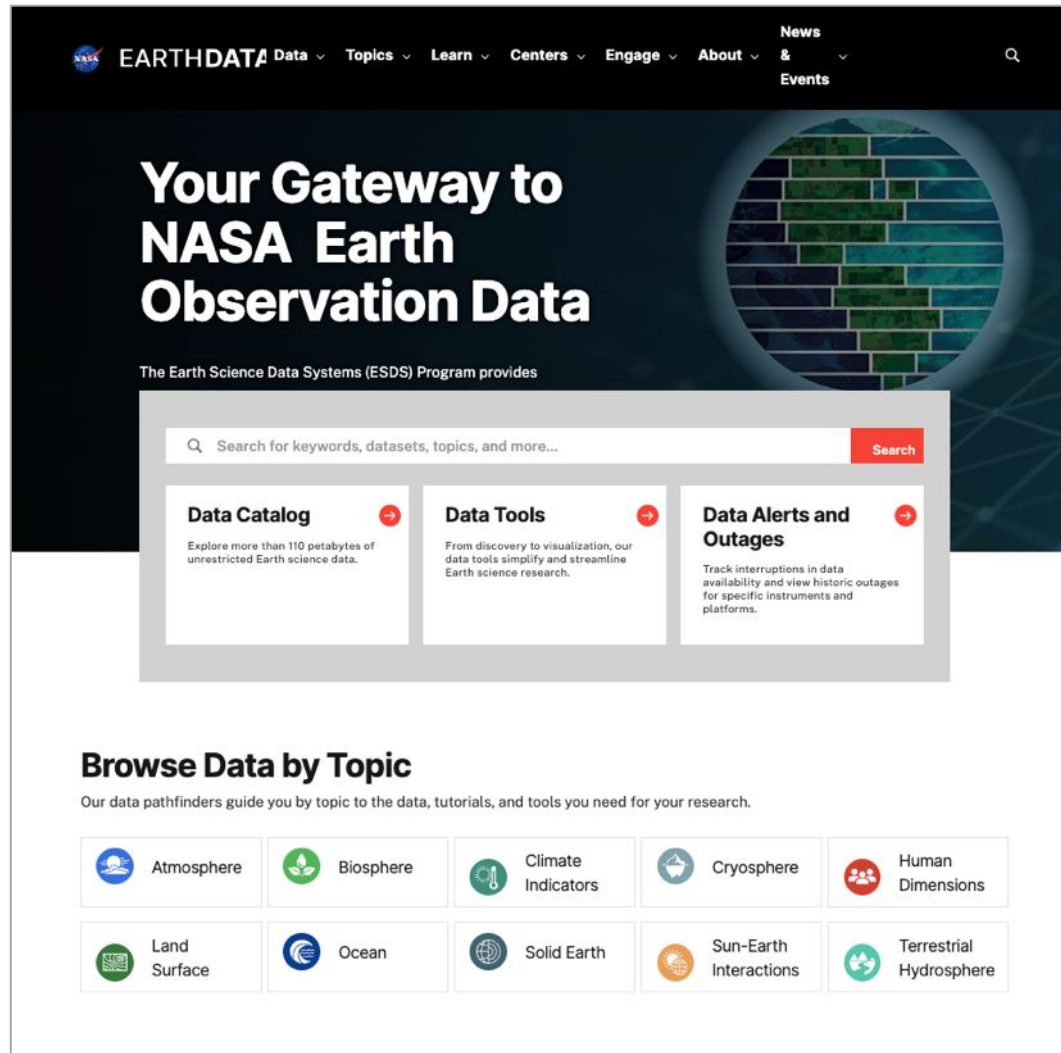
Sustainable cattle ranching restores forests, adding trees, shrubs, and live fences and providing bird habitat.



Protected areas conserve wetlands, water resources, and other critical habitat and wildlife corridors.



Innovative rotations of sugarcane and rice crops create artificial wetlands and bird habitat, mitigate flooding, and increase farm productivity.



Challenge:

- Not easily accessible to conservation practitioners in Latin America or processed in a way relevant to birds
- Lack of spatial products
 - Spatial data illustrating impacts of environmental change on bird species and habitat groups across Latin America and the Caribbean
- Social and economic opportunities (e.g., bird tourism potential) at relevant scales

Decision-support system for Colombia

Alas Seguras

Alas Seguras es una herramienta para conservacionistas que mapea y analiza datos espaciales sobre aves migratorias provenientes de Norteamérica (boreales) para apoyar decisiones de conservación en Colombia.

La herramienta le ayudará a identificar zonas de alto valor ecológico para distintos enfoques temáticos:

- **Módulo Áreas Agrícolas:** Poner en acción la agricultura regenerativa como la reforestación y la reconstrucción del suelo. Ejemplo de caso de uso: Cuanto area de agua superficial de alta valor ecológico para las aves de humedales preserva un area particular de ecosystemas agrícolas?
- **Módulo Áreas Ganaderas:** Avanzar la transformación hacia un modelo de ganadería sostenible en armonía con el entorno. Ejemplo de caso de uso: Donde debo establecer relaciones con ganaderos para convencerles plantar arboles para mejorar habitat para aves de bosques de tierras bajas y aumentar conectividad entre parques nacionales para las aves?
- **Módulo Comunidades Amigables con las Aves:** Trabajar con comunidades y grupos de interés en la creación de un movimiento de conservación sólido. Ejemplo de caso de uso: Convencer al gobierno de un municipio el valor de su area para las aves migratorias de bosque y su contribucion



<https://gis.audubon.org/alasseguras/>



Project Goal:

Improve end users' access to Earth observation derived products and biological model outputs to increase the efficiency and effectiveness of their decision-making process and outcomes for bird conservation and people across Latin America and the Caribbean.

Objectives:

1. Model changes in bird species distributions in response to projected environmental changes (~1100 species)
2. Map climate strongholds for habitat-based groups of bird species
3. Map index of bird friendliness (BFI) representing bird species abundance, conservation status and resilience.
4. Derive spatial layers characterizing conservation challenges for birds and benefits / harm for people
5. Scale up Alas Seguras decision-support tool to Latin America and the Caribbean

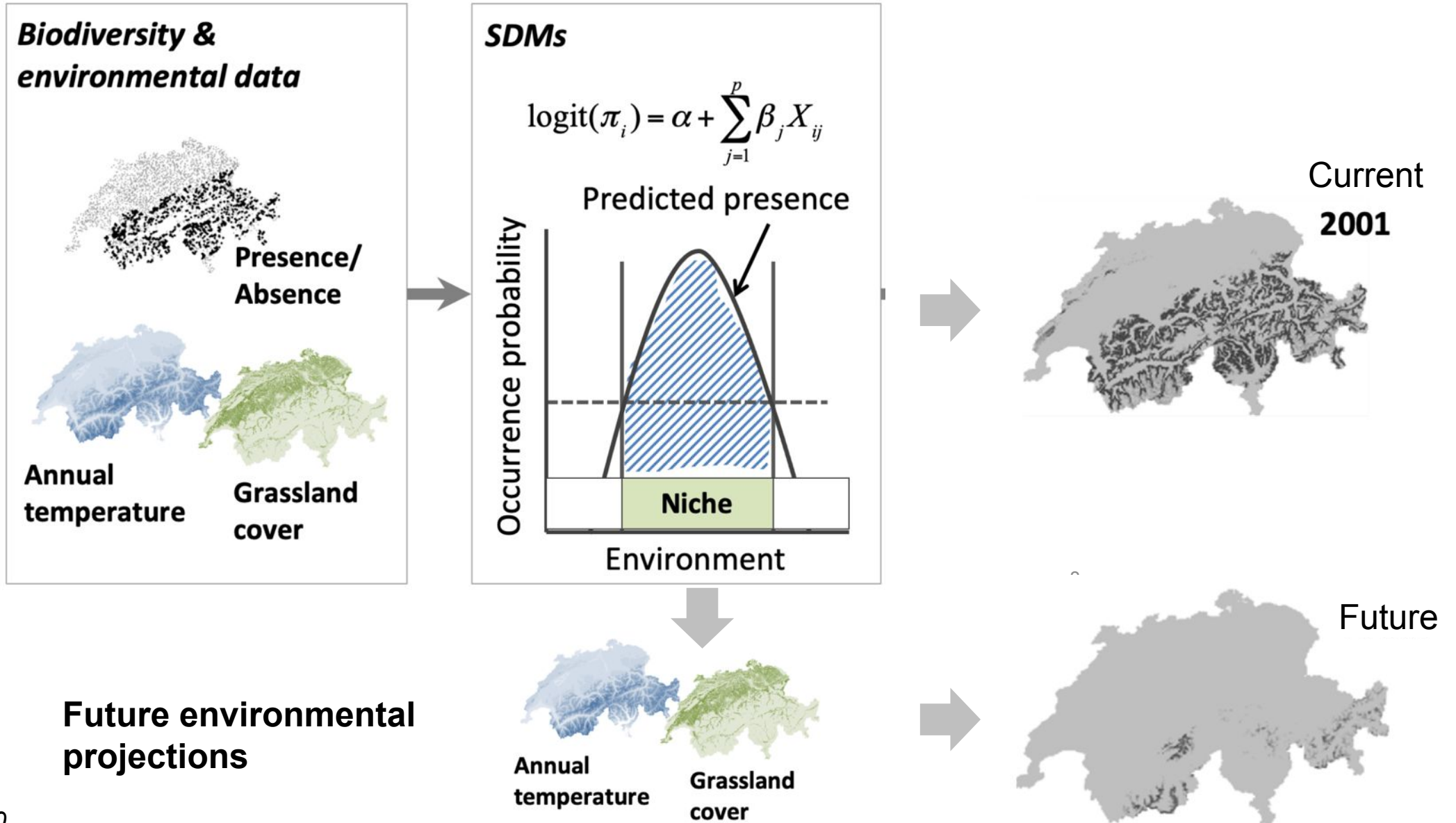
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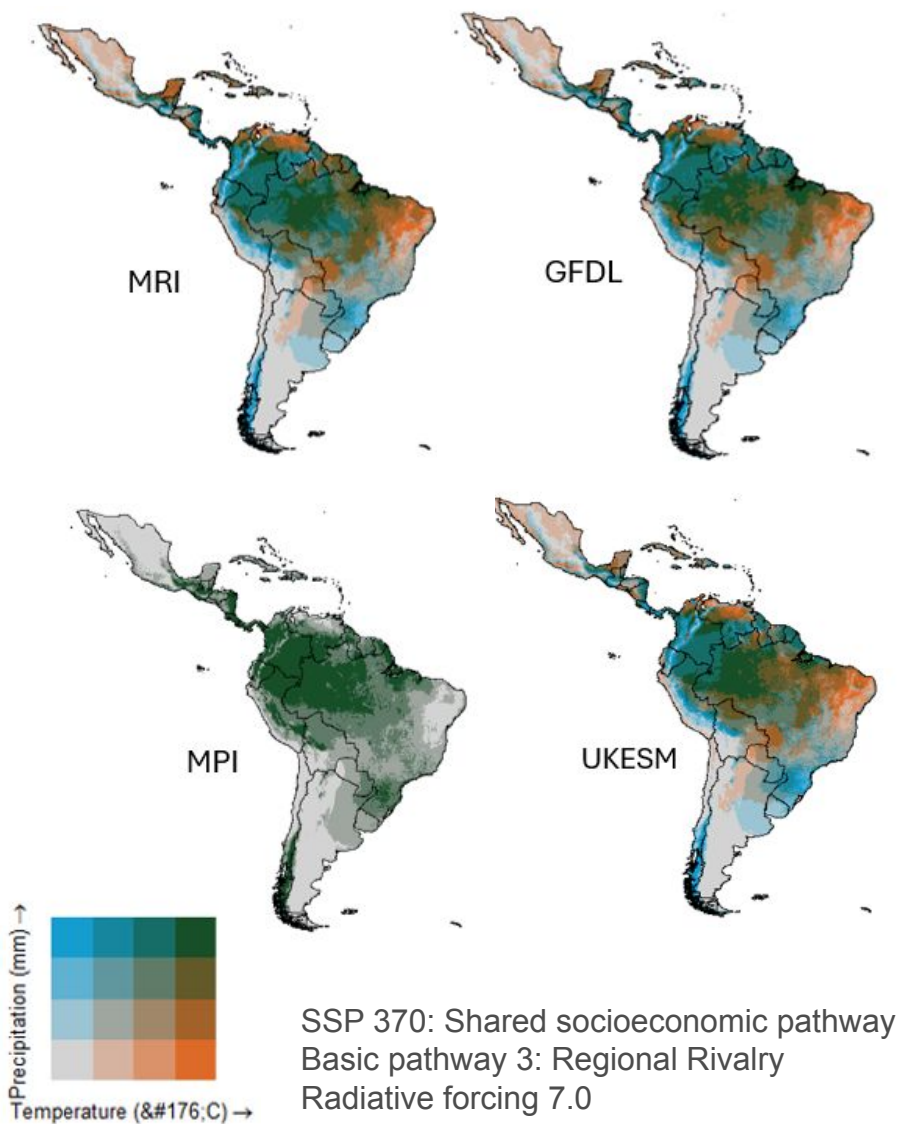
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Species Distribution Models (SDMs)



SDM Co-variates



Spatial Variable	Source Data	Citation
Sea level rise	NOAA Office for Coastal Management (2019)	Braaten et al. 2021
Elevation	GMTED2010 30arc (DOI/USGS/EROS), uses SRTM (NASA)	Danielson et al. 2011
Vegetation seasonality (Dynamic Habitat Index GPP)	MODIS (NASA Earth Observation)	Radeloff et al. 2019
Distance to coast	TIGER/Line Shapefile 2017 coastline	US Census Bureau 2017
Distance to shoreline	The World Data Bank II, the World Vector Shoreline	Wessel & Smith 1996
Distance to wetlands	Landsat (NASA Earth Observations)	Zhang et al. 2023
Surface water presence	European Comm Joint Res Cent, Landsat (NASA Earth Observation)	Pekel et al., 2016
Terrain Ruggedness	GMTED2010 30arc (DOI/USGS/EROS), uses SRTM (NASA)	Riley et al. 1999
Wetland type	Landsat (NASA Earth Observation)	Zhang et al. 2023
Vegetation / Land cover	MODIS (NASA Earth Observation), CMIP6	Chen et al. 2022
Climate baseline	CHELSA CMIP6, Landsat data input (NASA Earth Observation)	Karger et al. 2017
Climate future	CHELSA CMIP6, Landsat data input (NASA Earth Observation)	Karger et al. 2017
Topographic wetness index	GMTED2010 30arc (DOI/USGS/EROS), uses SRTM (NASA)	Danielson et al. 2011 (elevation input)
Future potential tree cover	Hansen et al. 2013 (uses GMTED2010)	Roebroek et al. 2025
Baseline potential tree cover	Hansen et al. 2013 (uses GMTED2010)	Roebroek et al. 2025

SDM workflow

Occurrence records
1,148 bird species

eBird



Clean occurrences –
occTest R package
(Serra-Diaz 2024)



Manual
validation



Models and future
projections built
using **Wallace
EcoMod's
functions**
(Kass et al. 2023)



Present
Conditions

Maxnet

Best
Model



Manual
validation

Future Projected
Conditions

3 time periods

2011-2040
2041-2070
2071-2100

4 GCM models

gfdl-esm4
mpi-esm1-2-hr
mri-esm2-0
ukesm1-0-ll

3 Shared
Socioeconomic
Pathways
(SSPs)

ssp126
ssp370
ssp585

41,328
models



Manual
validation

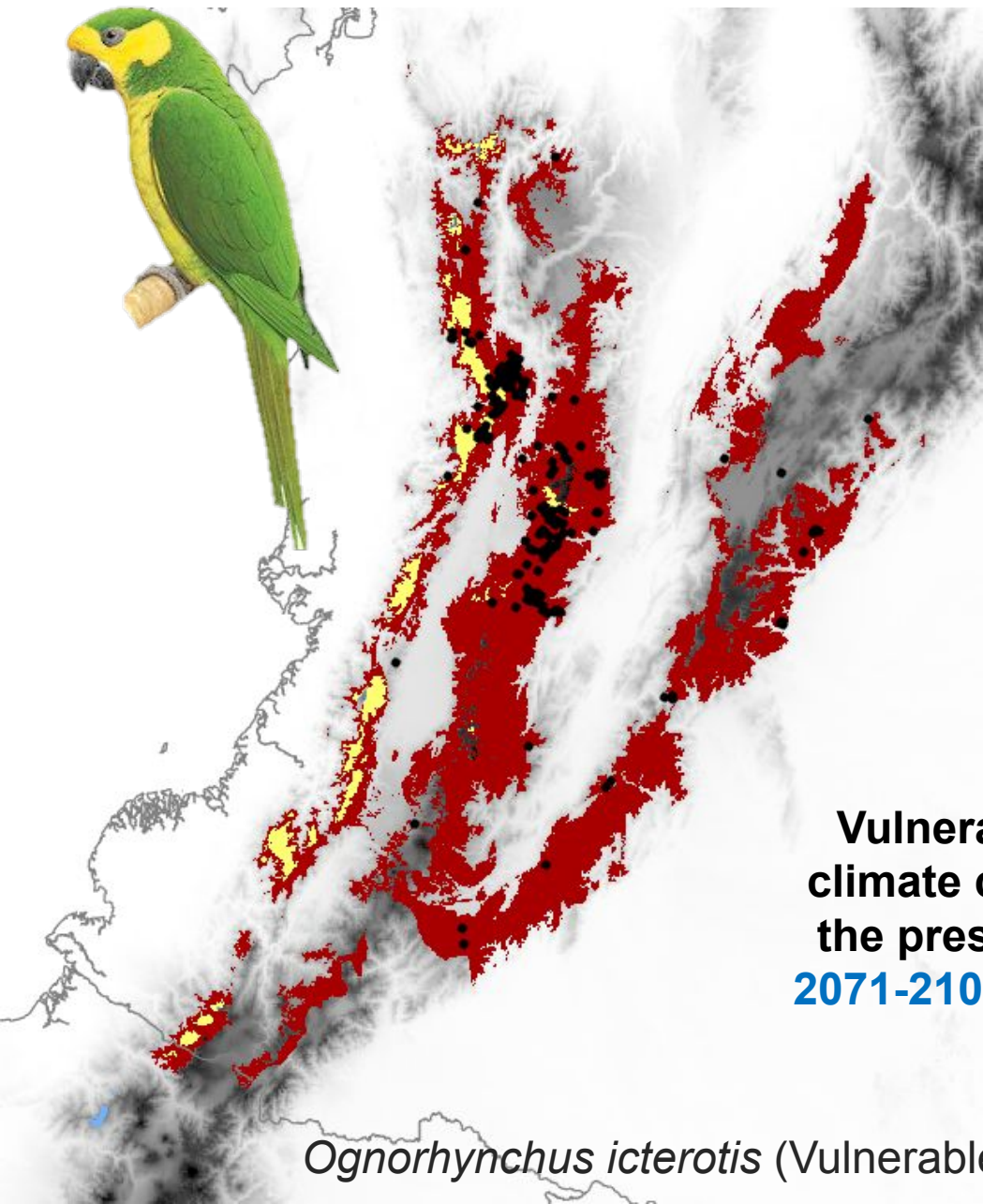
Vulnerability to climate change

Amazona auropalliata (Critically endangered)



Vulnerability of the species to climate change when comparing the present distribution and the 2041-2070 in the **SPP370 scenario** (assembly of 4 **GMC models**)

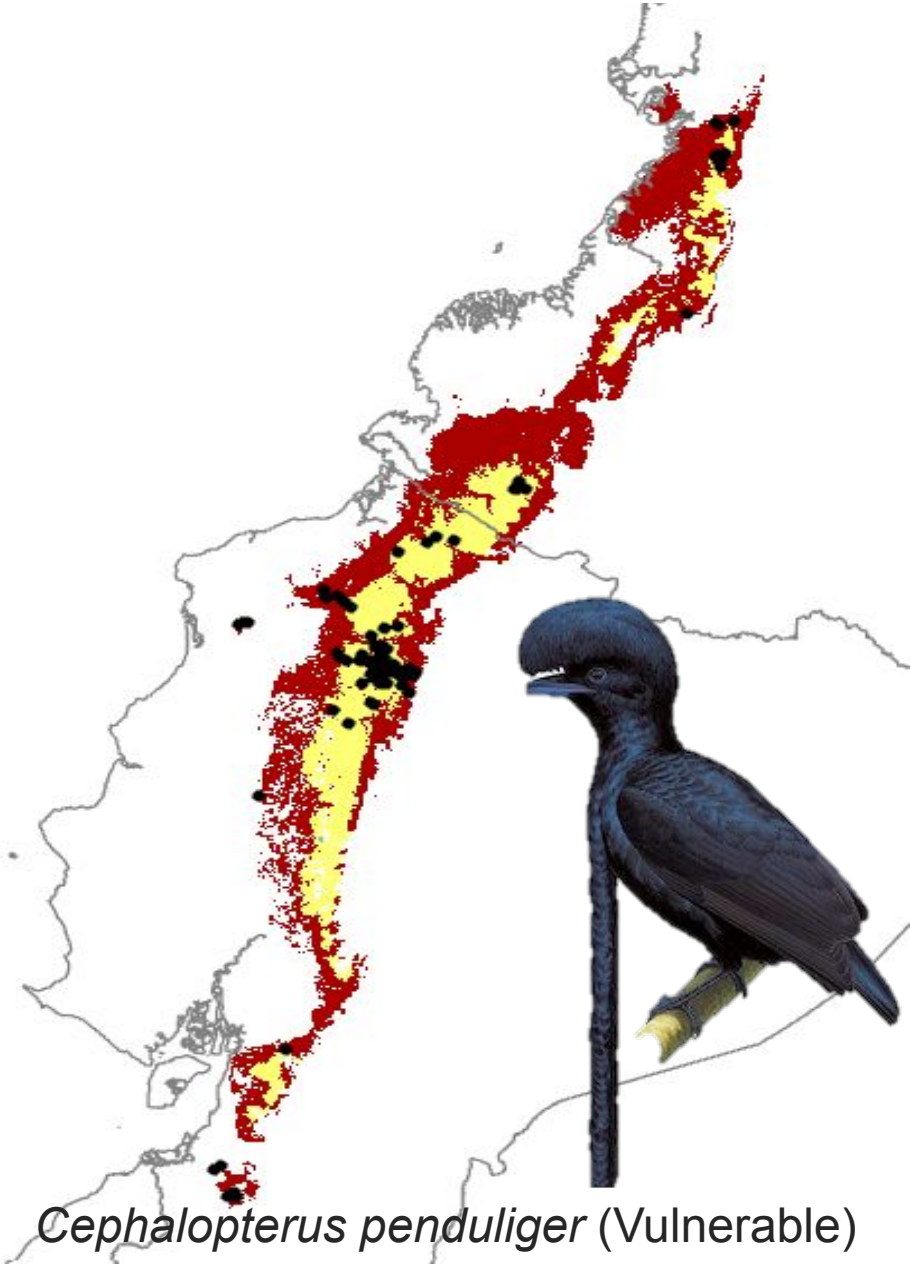
Vulnerability to climate change



Vulnerability of the species to climate change when comparing the present distribution and the 2071-2100 in the **SPP585 scenario**

Ognorhynchus icterotis (Vulnerable)

- Occurrence record
- Accessible area
- Lost
- Maintained
- Gained



Cephalopterus penduliger (Vulnerable)

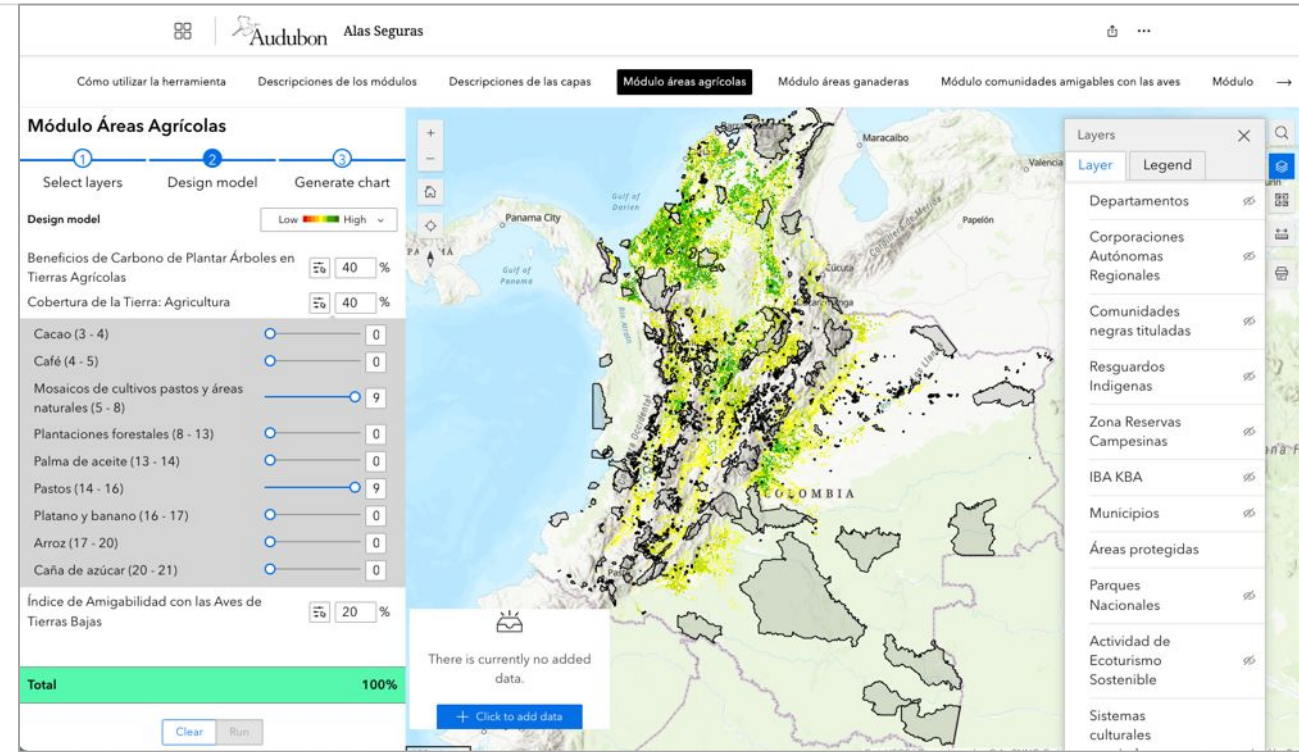
Alas Seguras End User engagement

- Expanded end user audience for scaled-up version of Alas Seguras for Latin America
- In-person workshop to co-prioritize data and DSS features though assessing prototypes in context of specific use cases followed by regular, iterative product development and evaluation



Alas Seguras Latin America

- **Experience with Colombia tool – strengths and opportunities for improvement**
- **Challenges with scaling up**
- **Prioritization of new spatial data and updated tool features**



Feature Category	Features	Reach	Impact	Confidence	Effort	RICE	Scoring	https://miko.com/app/board/uXjVIXu32JM=/	
Training	Written instructions on how to use the tool located in Help section	7	7	3	100	0.25	8400	Reach	count number of dots that are not red
Training	Clear documentation of what the layers represent	7	7	3	100	0.25	8400	Impact	if all red or no votes = .25
Data Layers	Data catalog that is easily searchable	7	7	3	100	0.5	4200		mostly red = 0.5
Exploring Results	Ability to minimize buttons and menus to maximize the full map	7	7	2	100	0.5	2800		mostly yellow = 1
Accessibility	Platform built in Spanish	7	7	3	100	1	2100		mostly green = 2
Data Layers	Data layers tagged by commonly used categories	7	7	3	100	1	2100		all green = 3
Data Analysis	Ability to weight individual layers to create a prioritization	7	7	3	100	2	1050	Confidence	percent of dots in agreement
Data Analysis	Filter	7	7	3	100	2	1050	Effort	rating of engineering difficulty, very high = 3
Data Analysis	Query	7	7	3	100	2	1050		high = 2
Data Layers	Ability to upload your own data layer for analysis	7	7	3	100	2	1050		medium = 1
Reporting/Exporting	Produce a dashboard or report with the info about my area of interest	7	7	3	100	2	1050		low = 0.5
									minimal = 0.25

Acknowledgements

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