SPATIAL ANALYSES AT THE EVALUATION AND MONITORING PROGRAM

APPLICATIONS AND CHALLENGES OF USING SDMS FOR BIODIVERSITY MANAGEMENT

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Modeling alpha diversity

Journal of Biogeography (J. Biogeogr.) (2015) 42, 976–988

ORIGINAL ARTICLE

Stacked species distribution models and macroecological models provide congruent projections of avian species richness under climate change

Trisha Distler[1]*, Justin G. Schuetz[1], Jorge Velásquez-Tibatá[1] and Gary M. Langham[2]

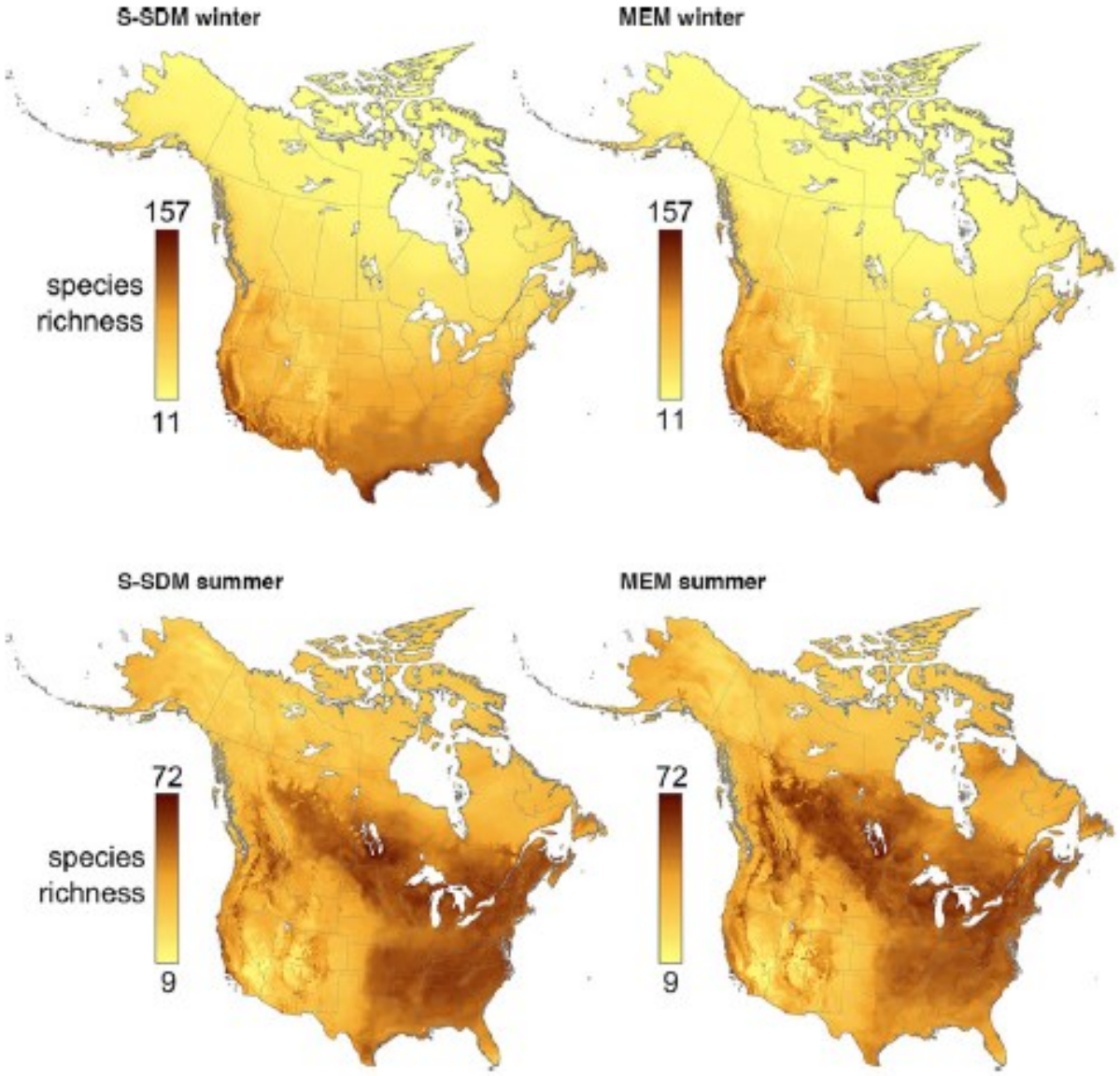
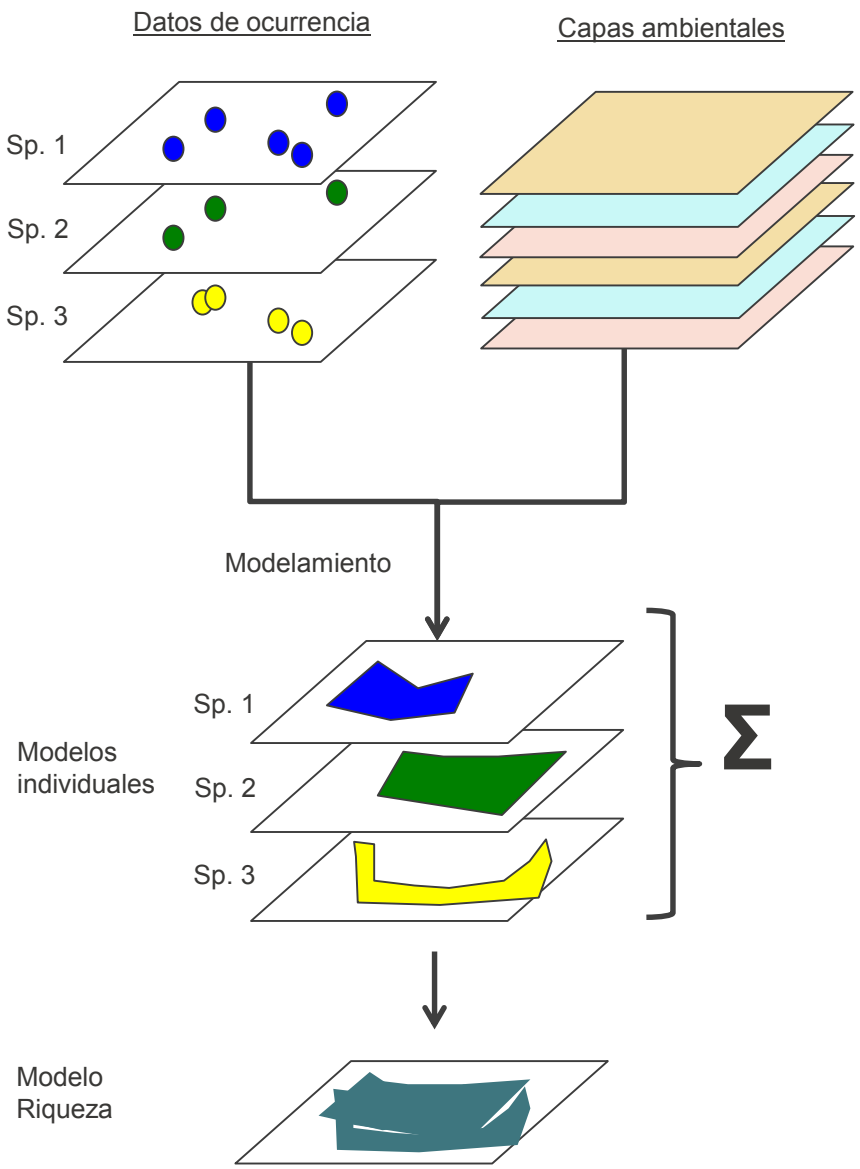
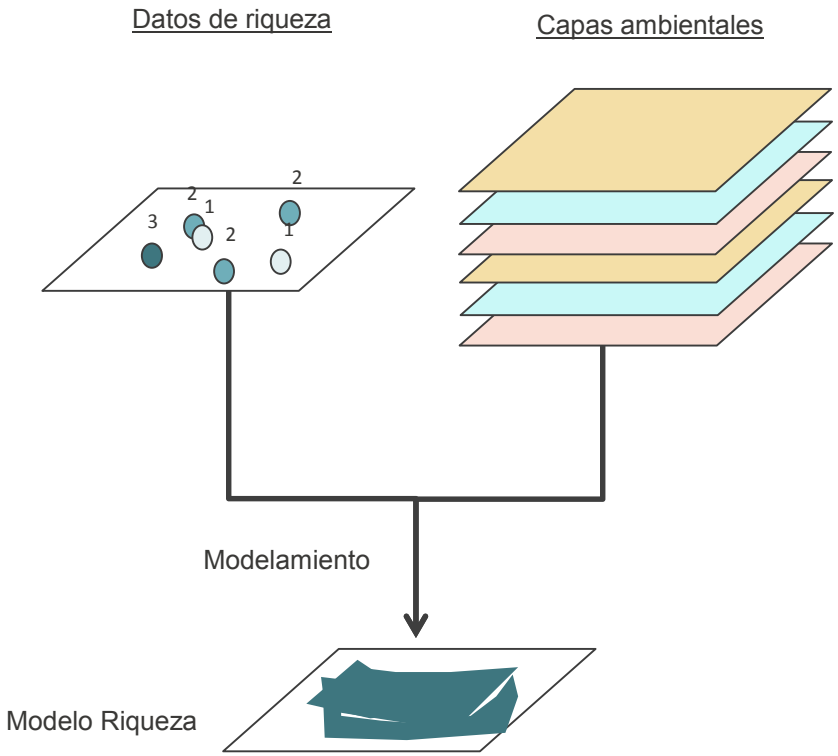


Figure 2 Estimates of current winter and summer species richness (2000–2009) of North American birds derived from stacked species distribution models (S-SDM) and macroecological models (MEM).

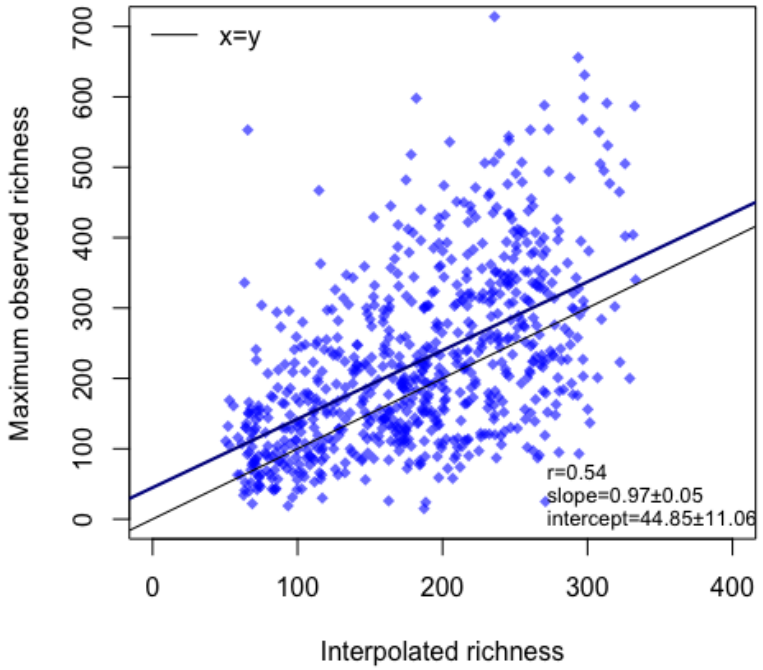
STACKING SDMS



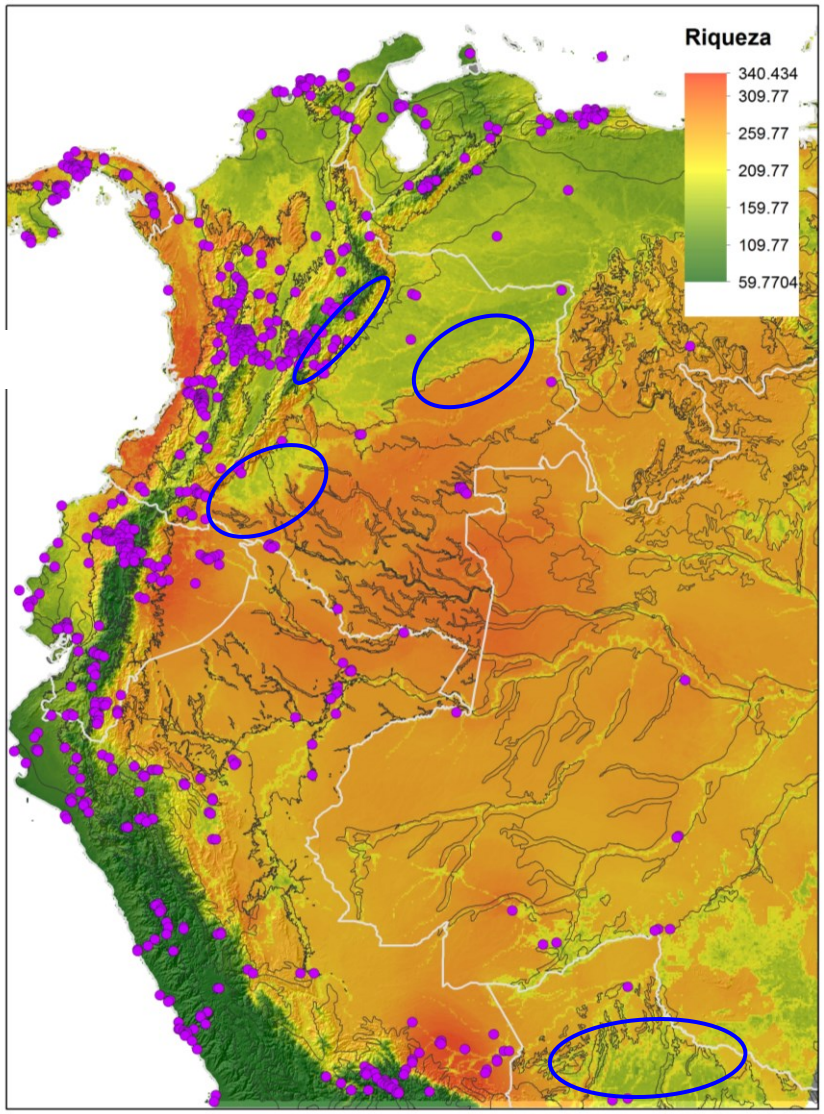
MACROECOLOGICAL MODELING



RESULTS: MACROECOLOGICAL MODELS

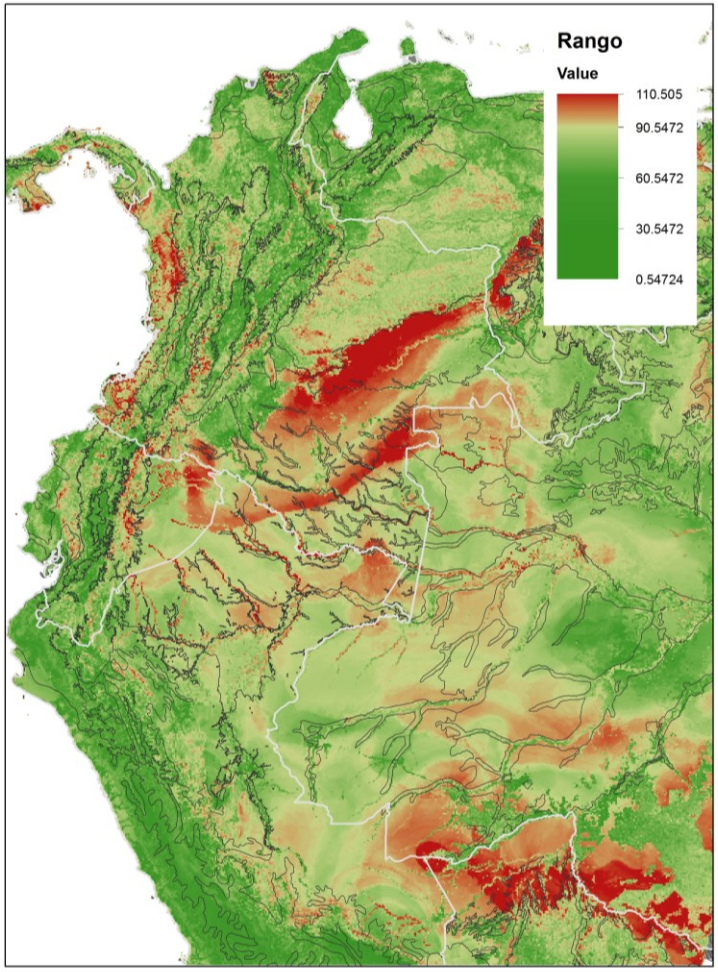


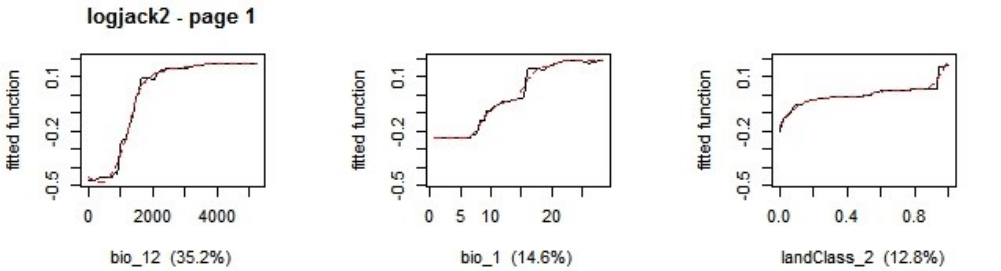
Understimation



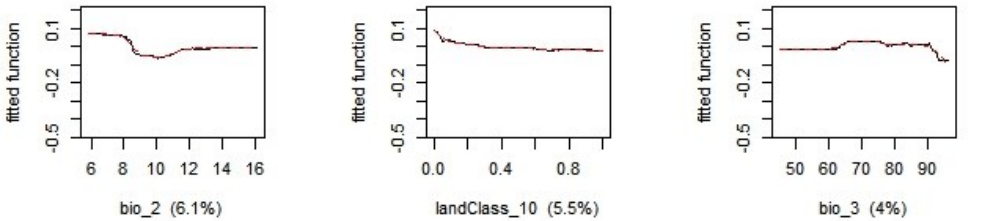
MAE: Reint – RMO: 71.1 spp.

RESULTS:MACROECOLOGICAL MODELS

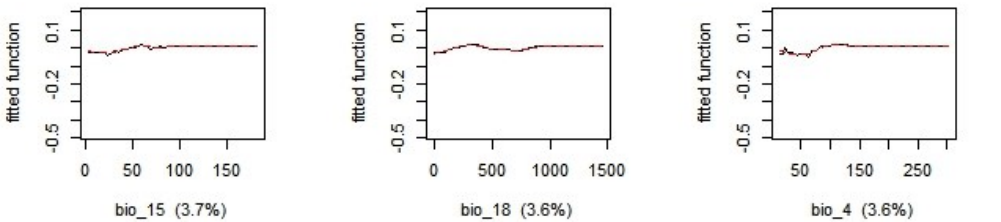




Precipitación anual | Temperatura media anual | Bosque siempre verde

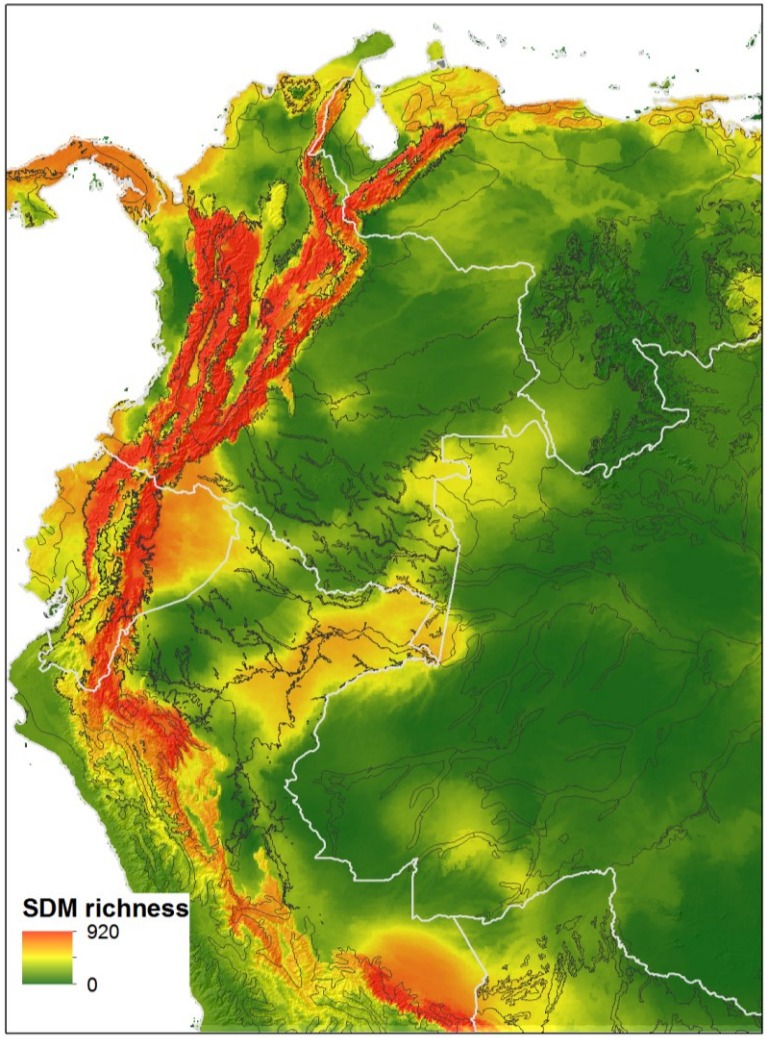


Rango temperatura diaria | Pastizales (Grasslands) | Isotermalidad

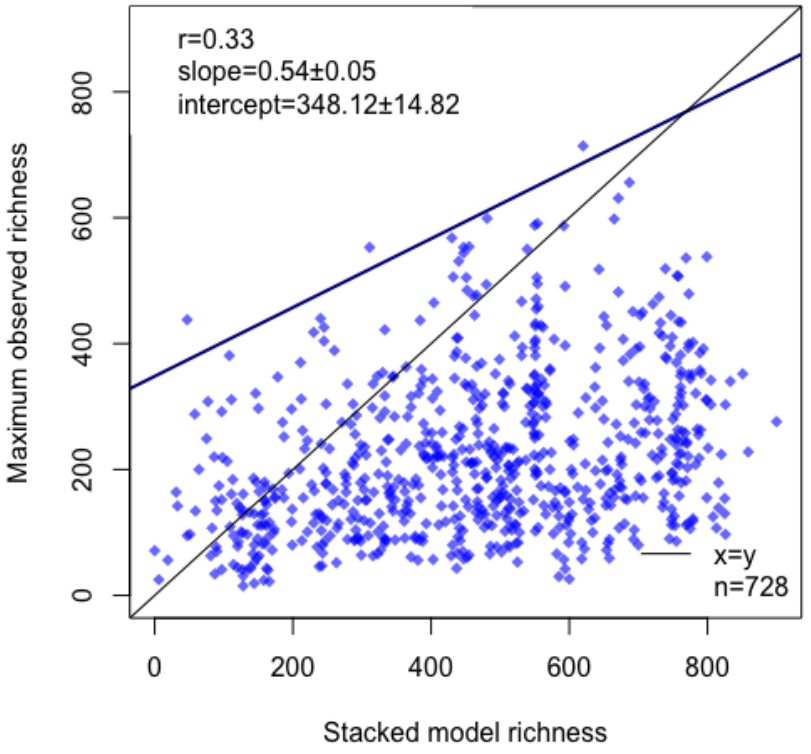


Estacionalidad precipitacion | Precipitacion trimestre más cálido | Estacionalidad temperatura

RESULTS: STACKING SDMS

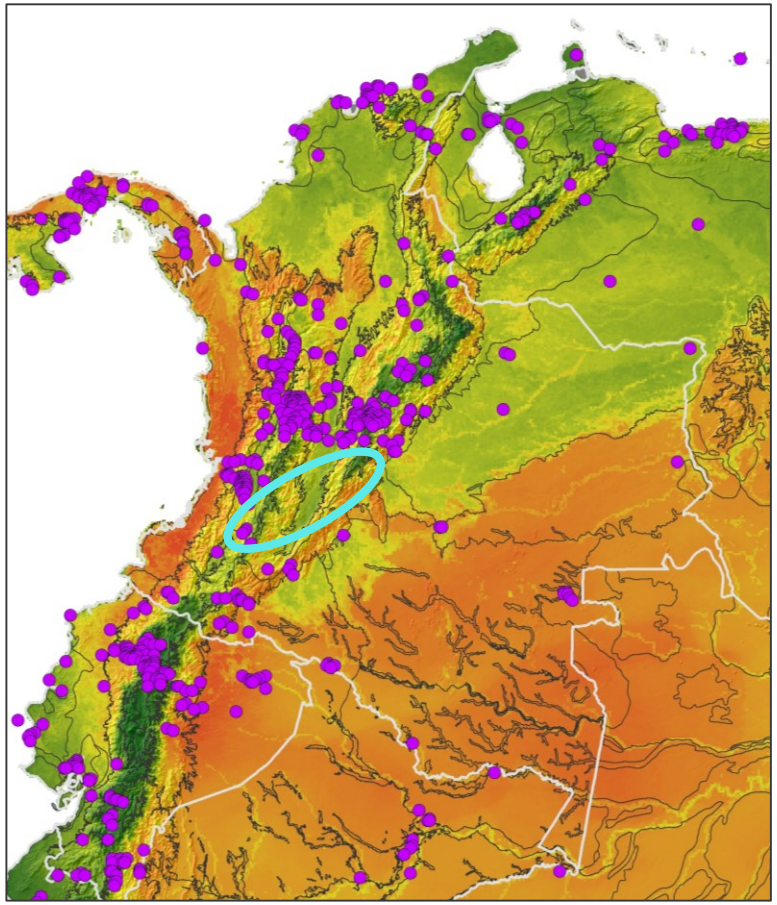


MAE $R_{S\text{-}EXP}$ – RMO: 300.44 spp.

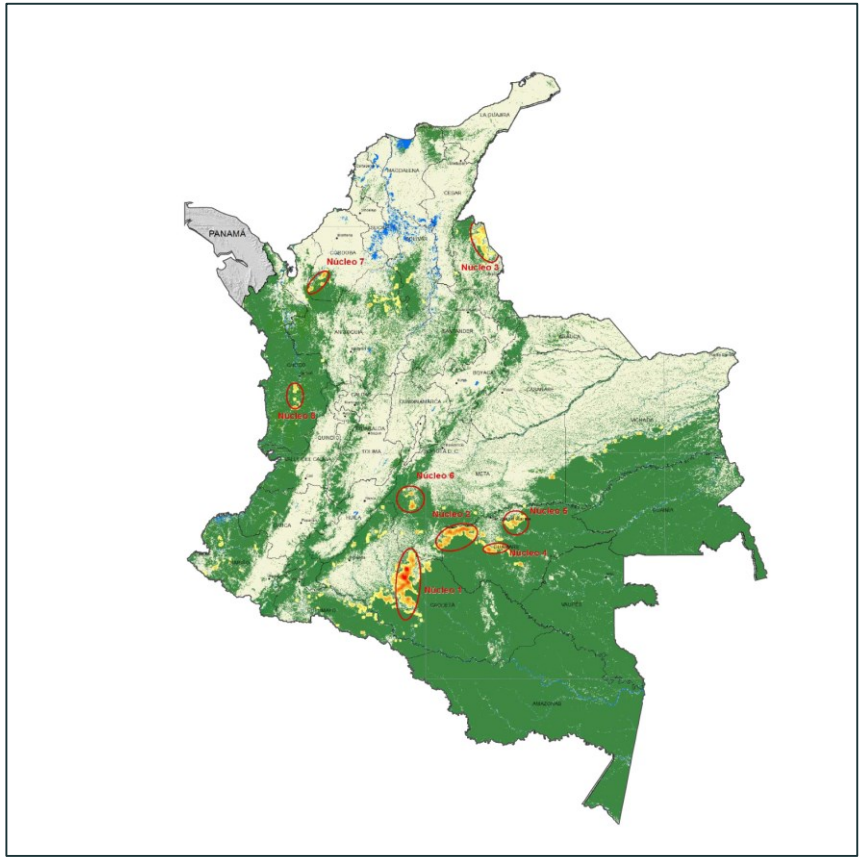


NEXT STEPS: SPECIES RICHNESS INDICATOR

Proyecciones anuales de riqueza de especies
IAvH



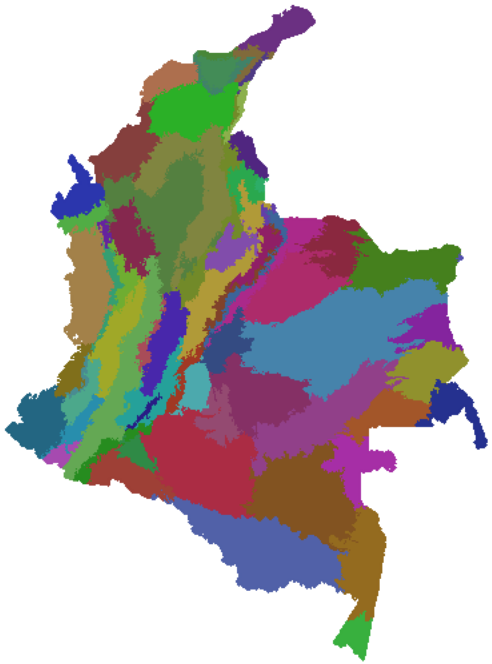
Núcleos activos por deforestación
IDEAM

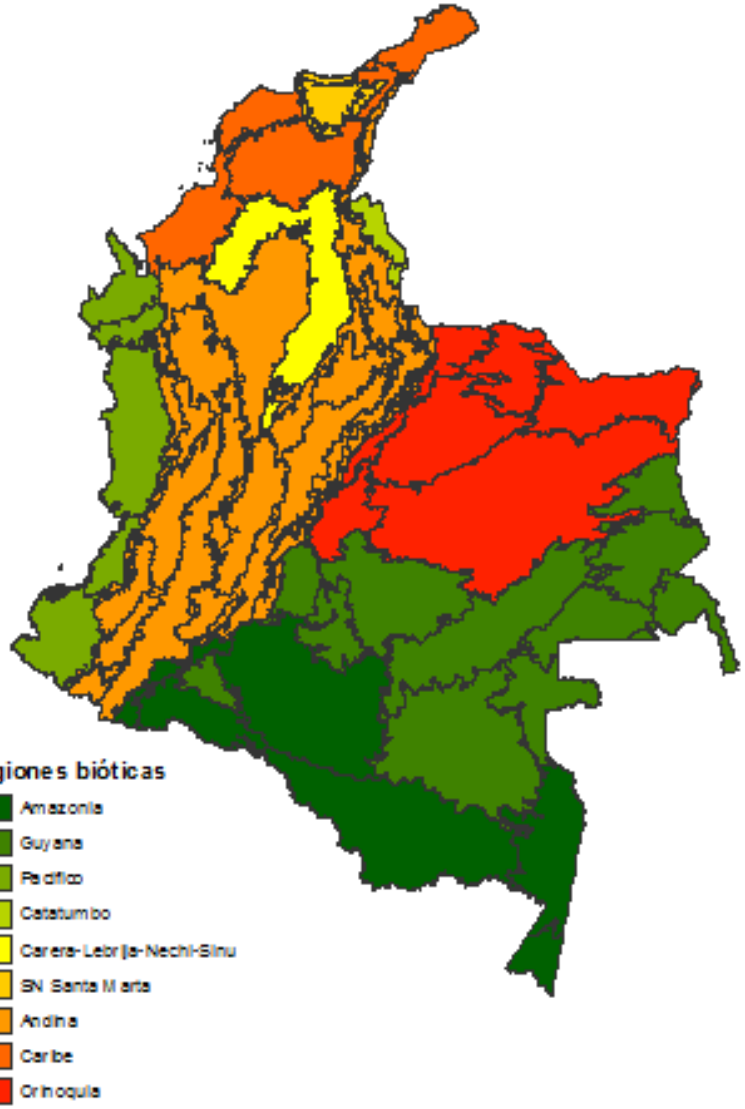


MODELING BETA DIVERSITY

HIERARCHICAL CLUSTERING OF SDMS

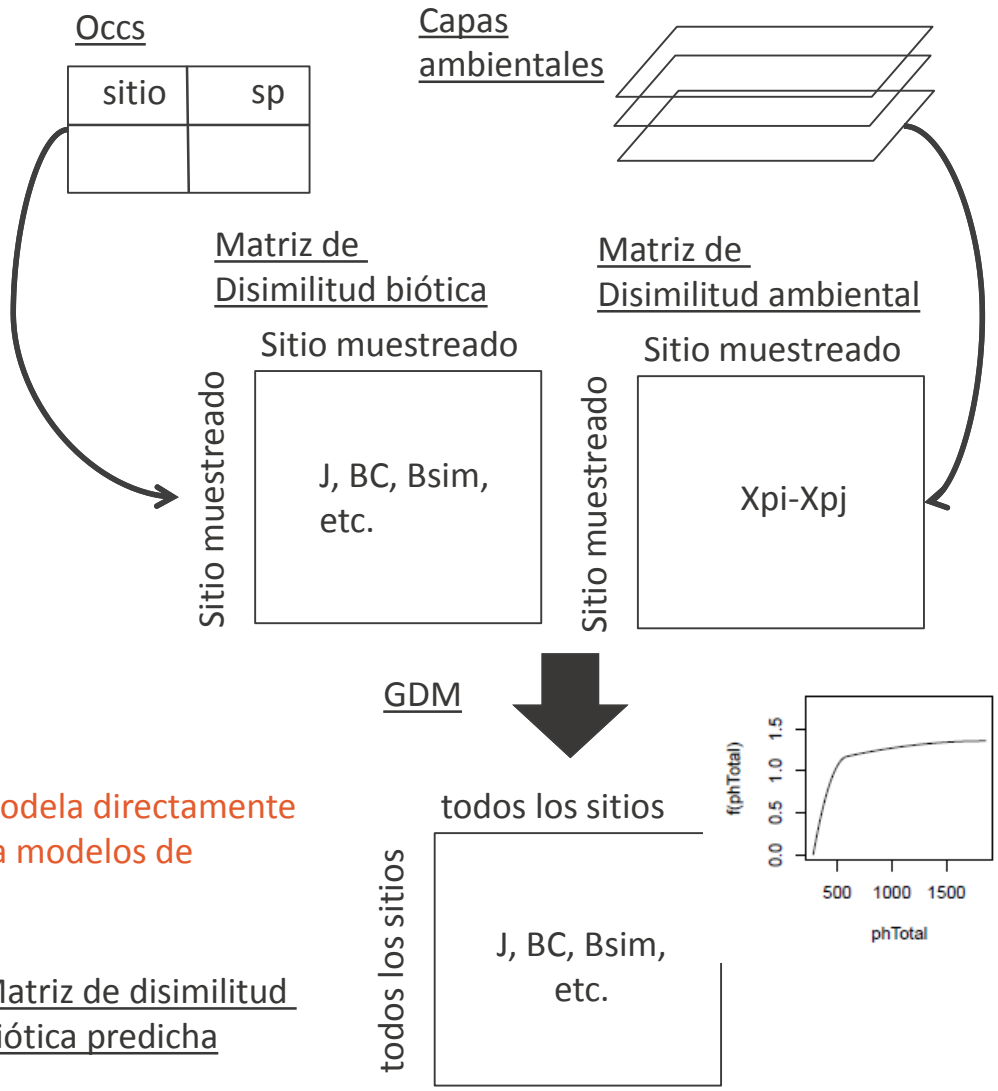
- Based on Kreft and Jetz (2010)
- ~ 5800 species distribution models
- 67 biotic units / 9 regions
- Basis for regionalization of the 2015 map of colombian ecosystems





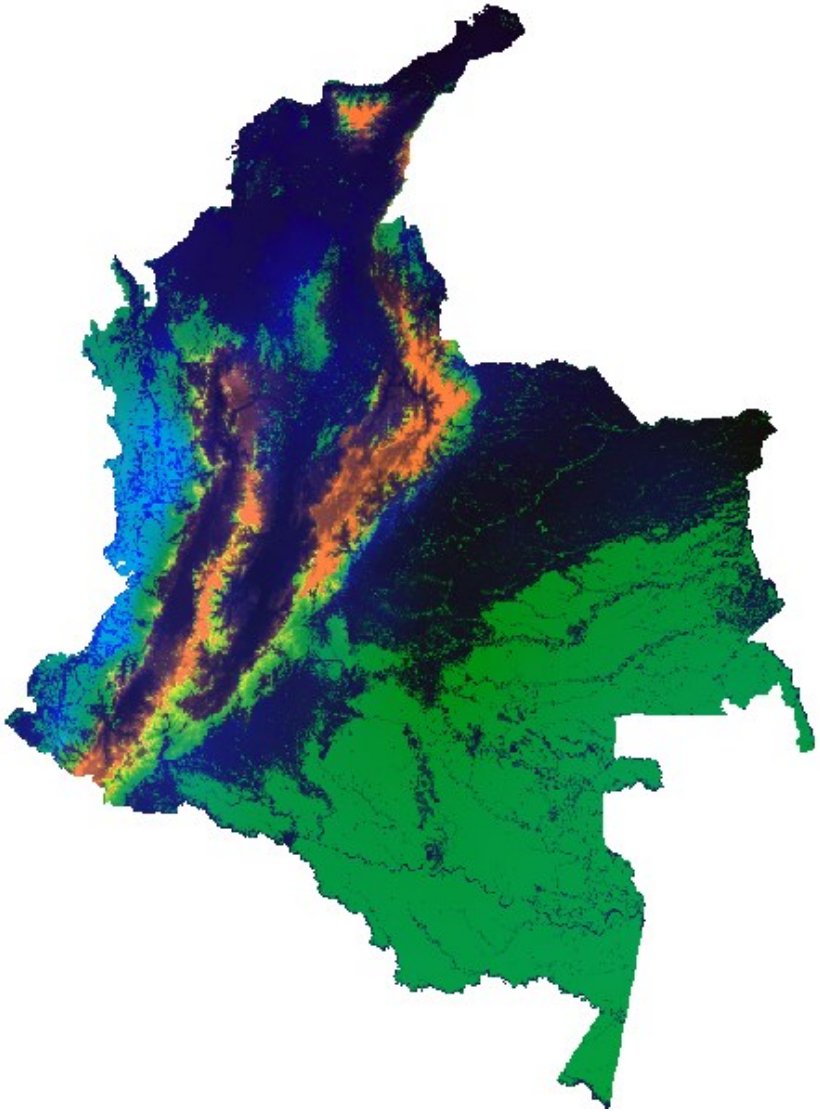
GENERAL DISSIMILARITY MODELING

El modelamiento generalizado de disimilitud (GDM; Ferrier et al. 200), permite establecer la relación entre la disimilitud y covariables ambientales, que determinan la diversidad beta, permitiendo su inferencia en sitios no muestreados. Al ser generalizado, es flexible en el tipo de respuesta (monotónica, unimodal etc.) que tiene la disimilitud a distintas variables ambientales



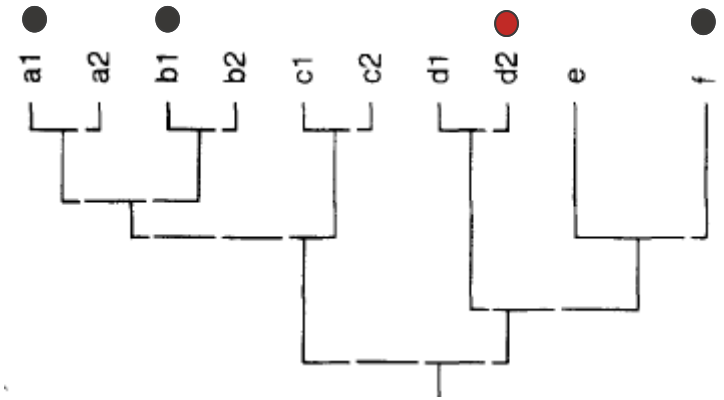
Ojo: esta aproximación modela directamente la disimilitud sin recurrir a modelos de distribución de especies.

RESULTS: BIRDS GDM



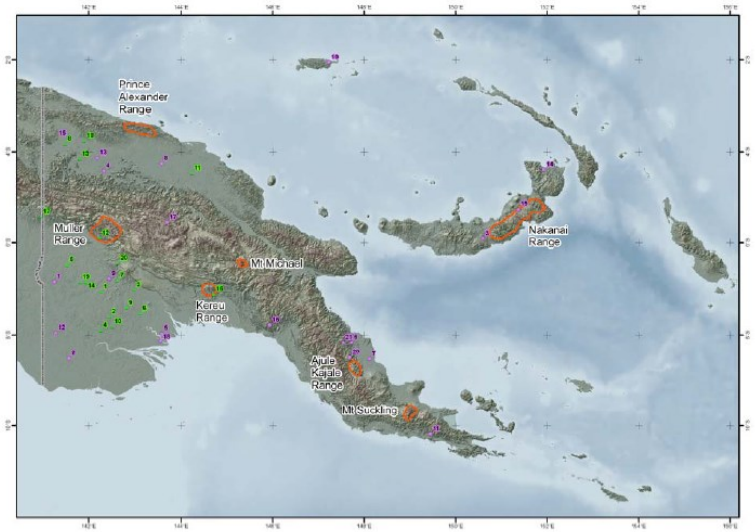
FIND OPTIMALLY COMPLEMENTARY SITES FOR BIOLOGICAL SURVEYS

Find the site or set of sites with the most biologically dissimilar composition from sampled sites (Faith & Walker 1996)

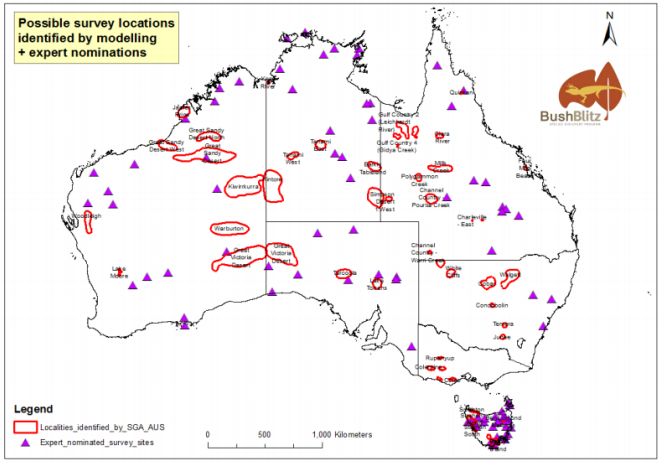


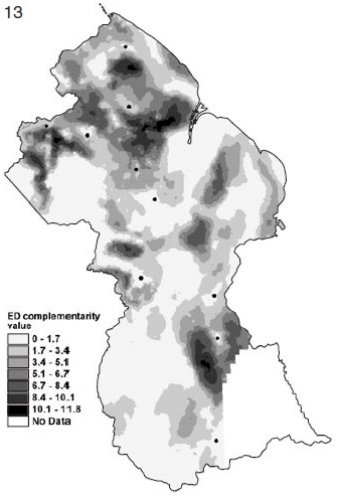
BACKGROUND

Papua – Nueva Guinea (Williams et al. 1998)

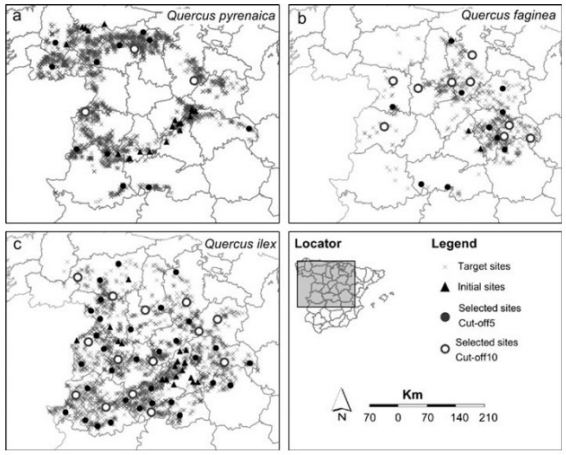


Australia/Tanzania(Williams et al. 2016)



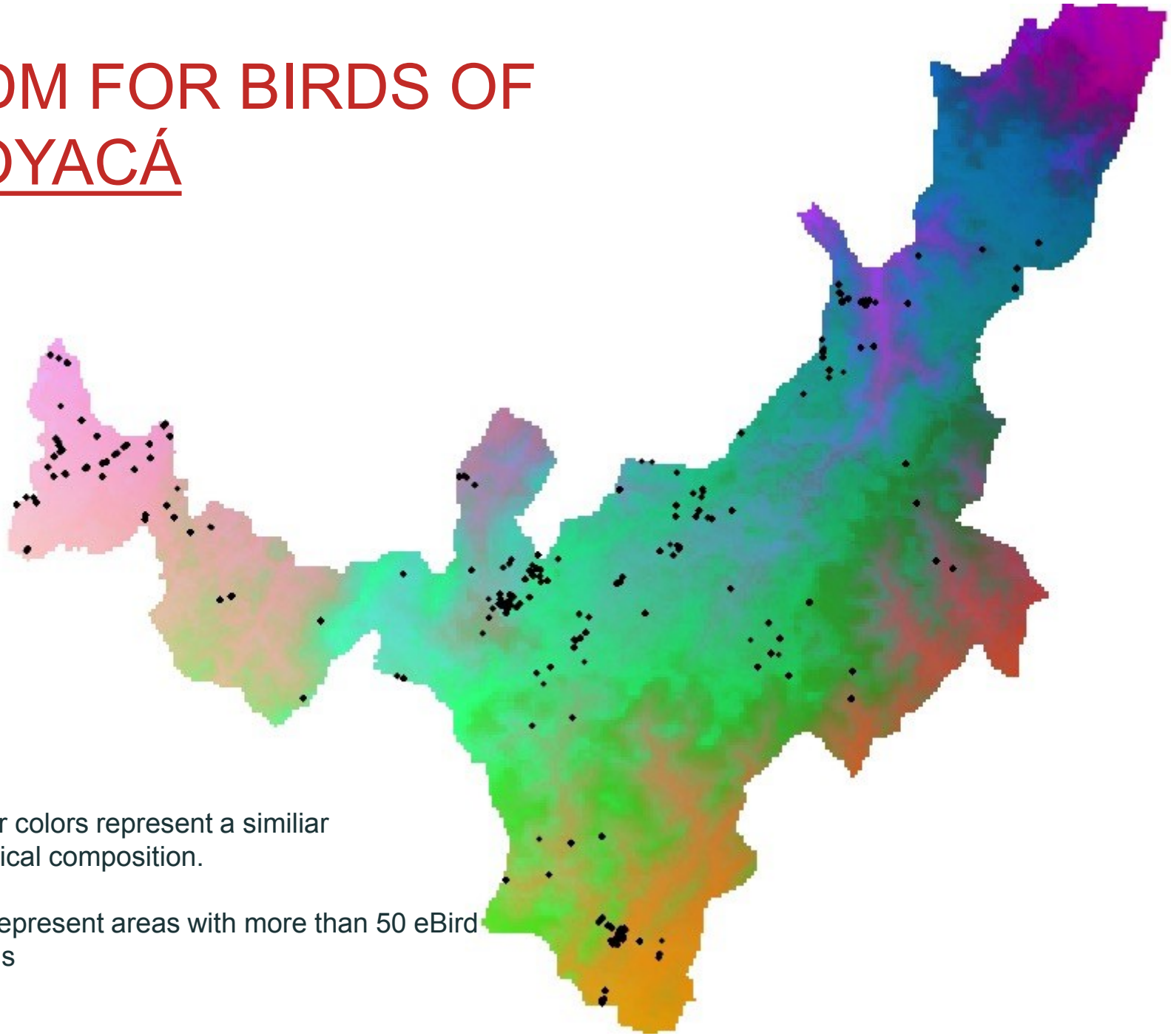


Guyana (Funk et al 2005)



España (Medina et al 2013)

GDM FOR BIRDS OF BOYACÁ



Similar colors represent a similiar Biological composition.

Dots represent areas with more than 50 eBird records

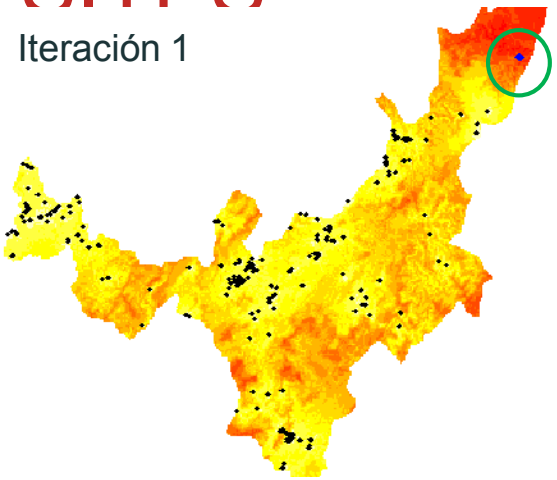
GDM FOR BIRDS OF BOYACÁ

This methodology allows users to find the most complementary area with respect to sampled localities

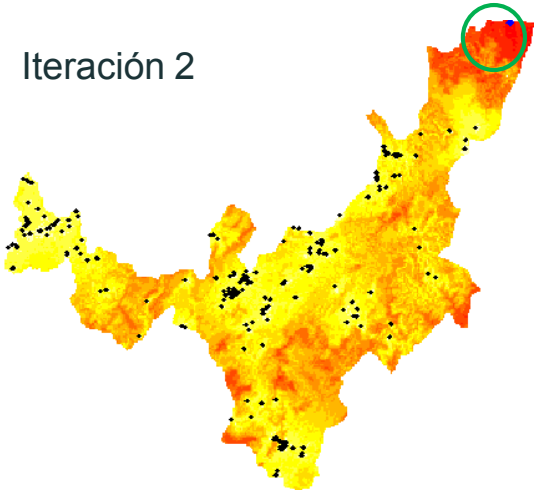
Most complementary area

GREEDY ALGORITHM FOR ITERATIVE OPTIMAL SELECTION OF SITES

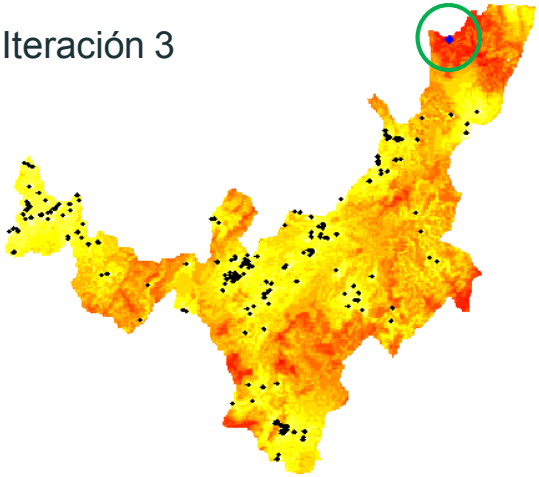
Iteración 1



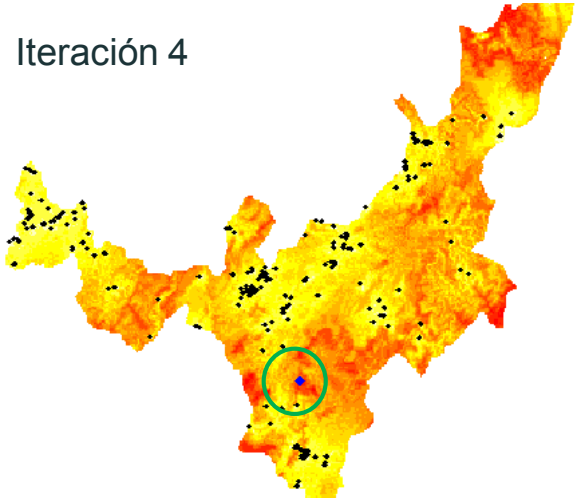
Iteración 2



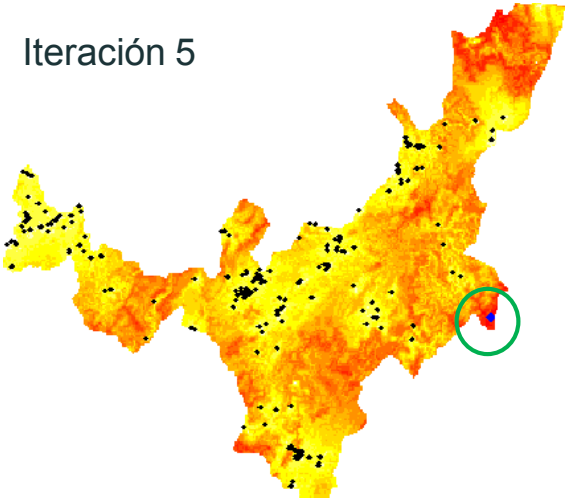
Iteración 3



Iteración 4

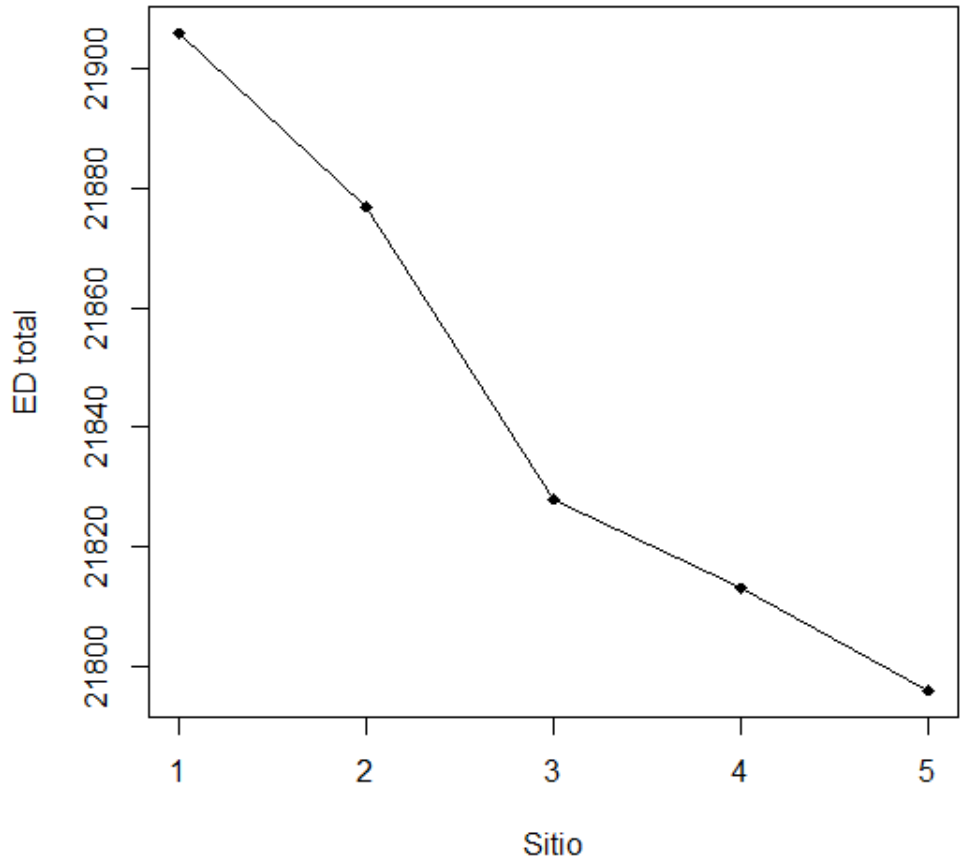


Iteración 5



The complemetary surface changes as new sites are added to the set of sampled sites.

ESTIMATION OF REQUIRED SAMPLING EFFORT

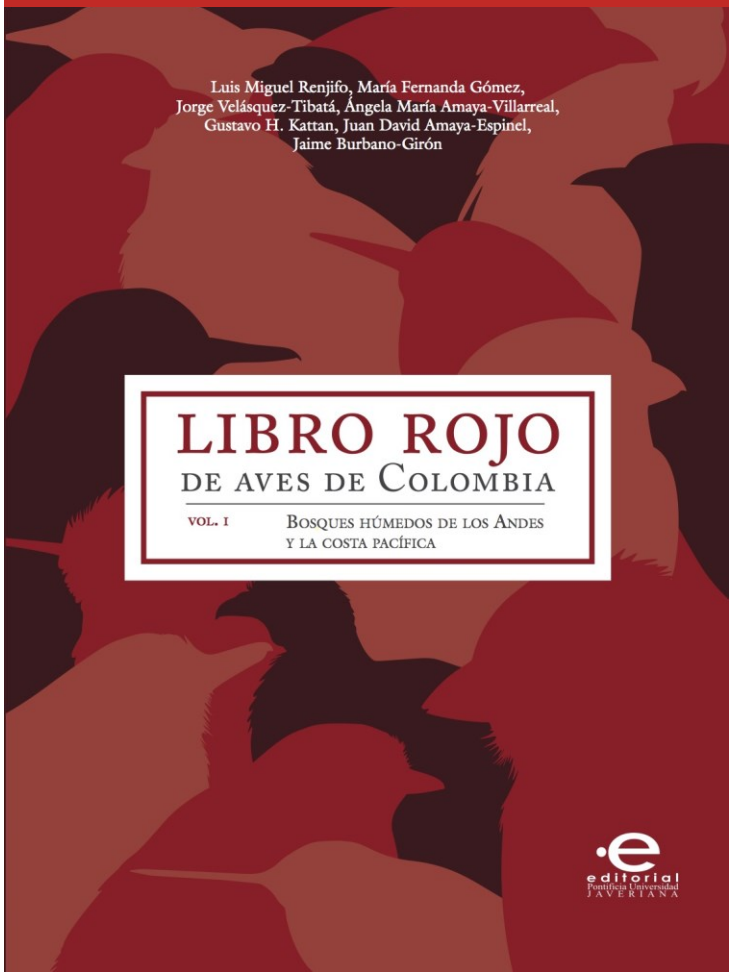


Sampling does not offer any gains when the total ED is stable after adding survey sites.

Computing parameters for IUCN risk evaluations

Risk assessments

Libro rojo de aves de Colombia



MINISTERIO DE AMBIENTE Y DESARROLLO SOSTENIBLE

RESOLUCIÓN No 0192

(10 FEB 2014)

"Por la cual se establece el listado de las especies silvestres amenazadas de la diversidad biológica colombiana que se encuentran en el territorio nacional, y se dictan otras disposiciones".

LA MINISTRA DE AMBIENTE Y DESARROLLO SOSTENIBLE

En ejercicio de sus facultades constitucionales y legales, y en especial las conferidas en el numeral 23 del artículo 5 de la Ley 99 de 1993, y numeral 2 del artículo 2 del Decreto – Ley 3570 de 2011, y,

CONSIDERANDO:

Que los artículos 8, 79 y 80 de la Constitución Política de Colombia señalan que es deber del Estado proteger la diversidad e integridad del ambiente; conservar las áreas de especial importancia ecológica, fomentar la educación para el logro de estos fines; planificar el manejo y aprovechamiento de los recursos naturales para garantizar su desarrollo sostenible, su conservación, restauración o sustitución.

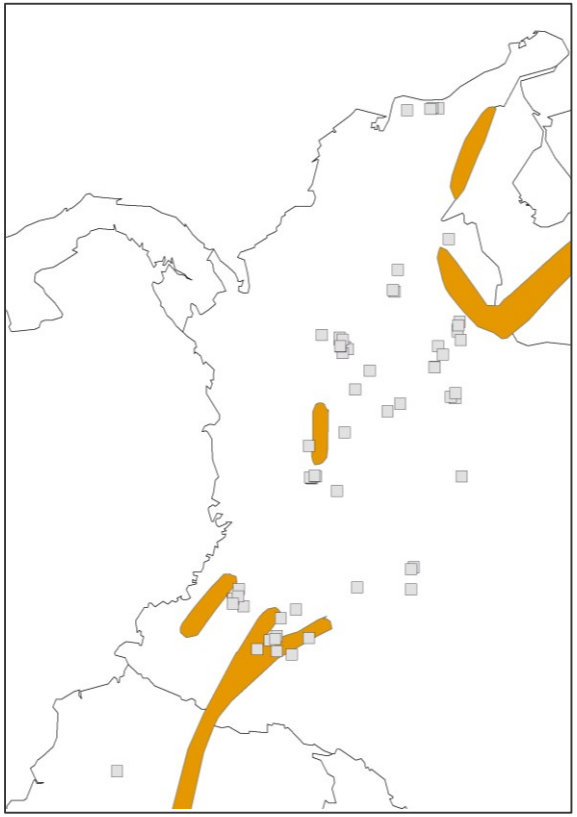
Que el numeral 8 del artículo 95 de la norma de normas, dispone que son deberes de la persona y del ciudadano, entre otras, la de proteger los recursos culturales y naturales del país y velar por la conservación de un ambiente sano; proteger los recursos naturales del país y velar por la conservación de un ambiente sano.

Que el artículo 1 del Decreto - Ley 2811 de 1974, Código Nacional de los Recursos Naturales Renovables y de Protección al Medio Ambiente, señala que la preservación y manejo de los recursos naturales renovables también son de utilidad pública e interés social.

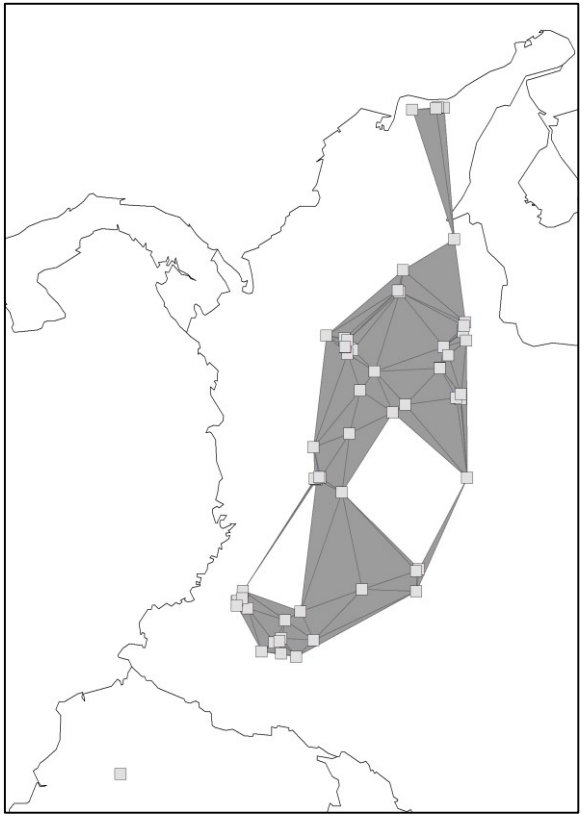
Que el artículo 196 del citado Código, establece que se deberán tomar las medidas necesarias para conservar o evitar la desaparición de especies o individuos de la flora que por razones de orden biológico, genético, estético, socioeconómico o cultural deban perdurar.

Que de acuerdo con el artículo 258 de este Código, corresponde a la administración pública, en lo relativo a fauna silvestre y caza, entre otras, la de velar por la adecuada conservación, fomento y restauración de la fauna silvestre.

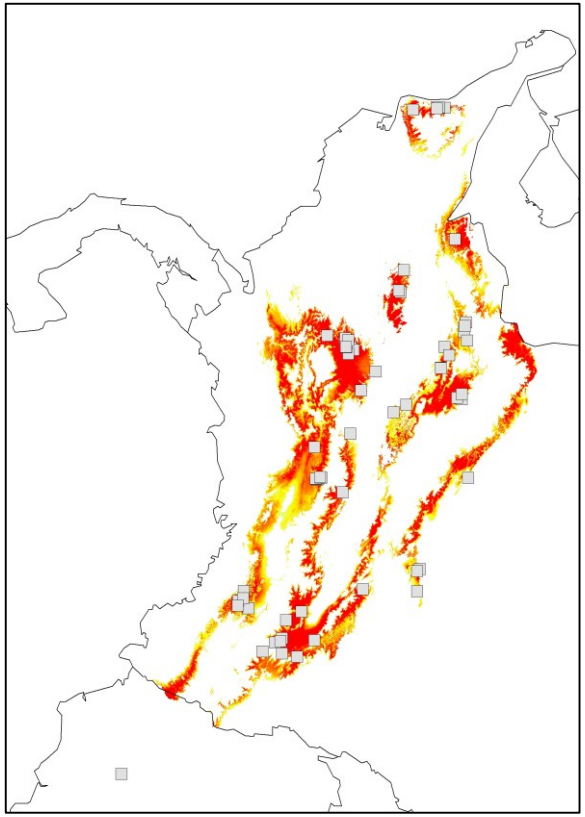
Geographic characterization of species distributions



Expert maps

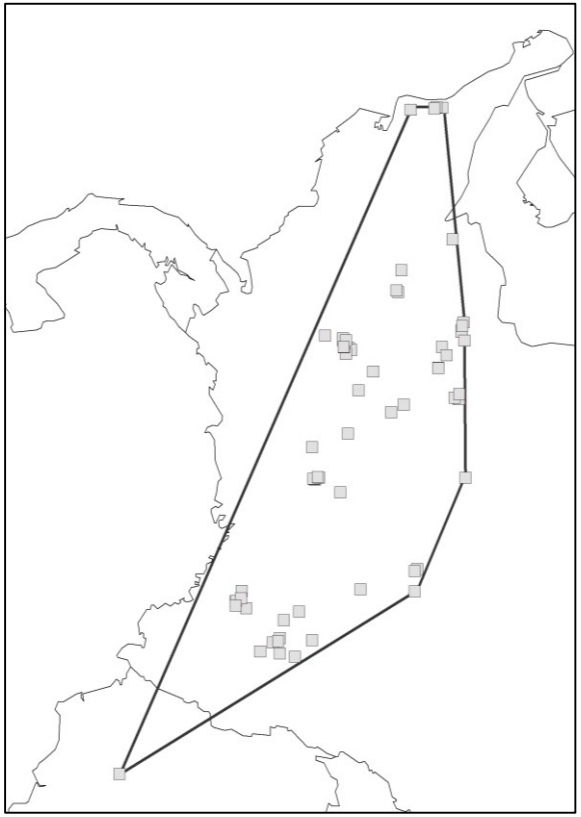


Alpha Hulls

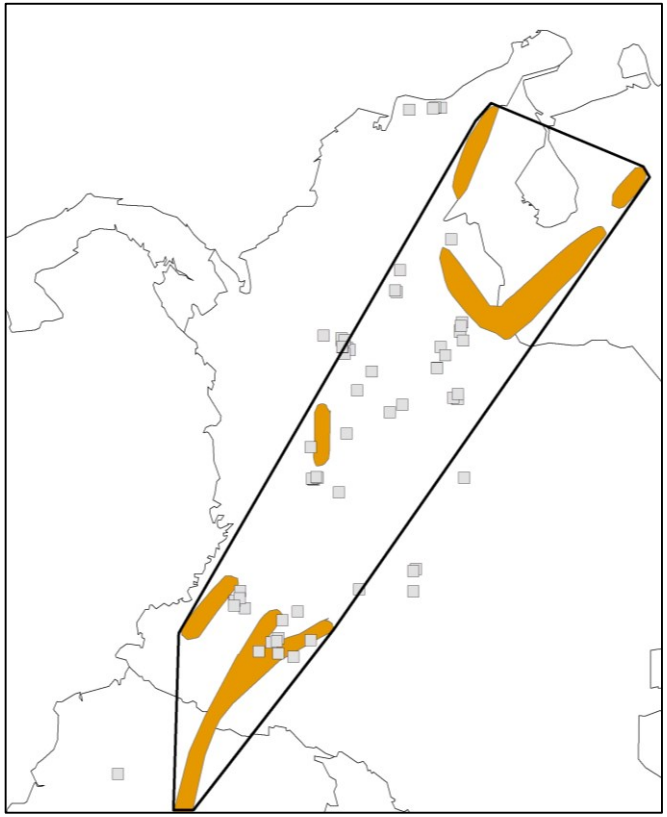


Species distribution models

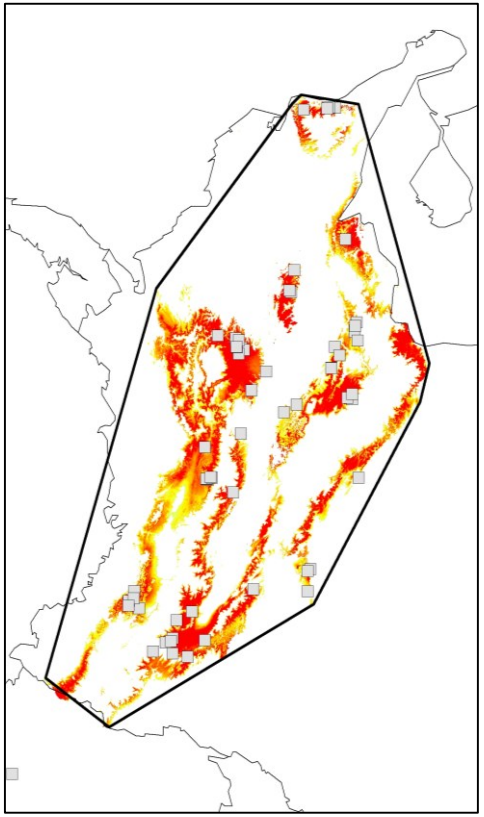
Measuring extent of occurrence



Convex hulls



Expert maps

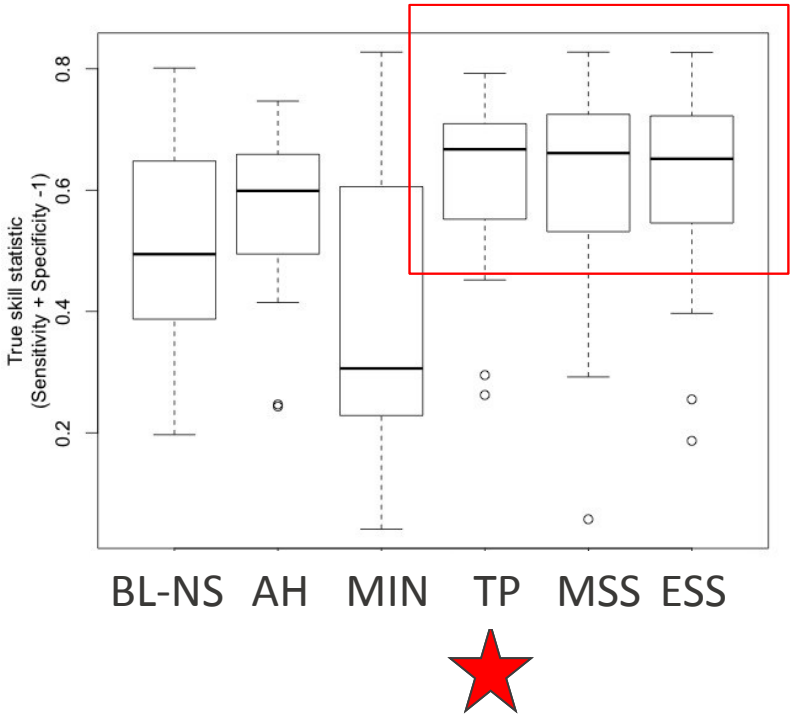


SDMs

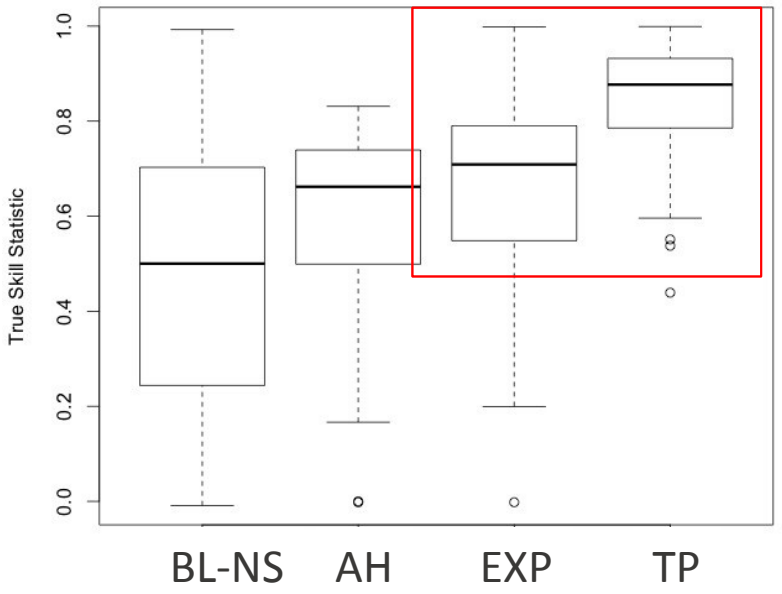
Velásquez-Tibatá et al. *in prep.*

¿What is the most exact method to characterize species distributions?

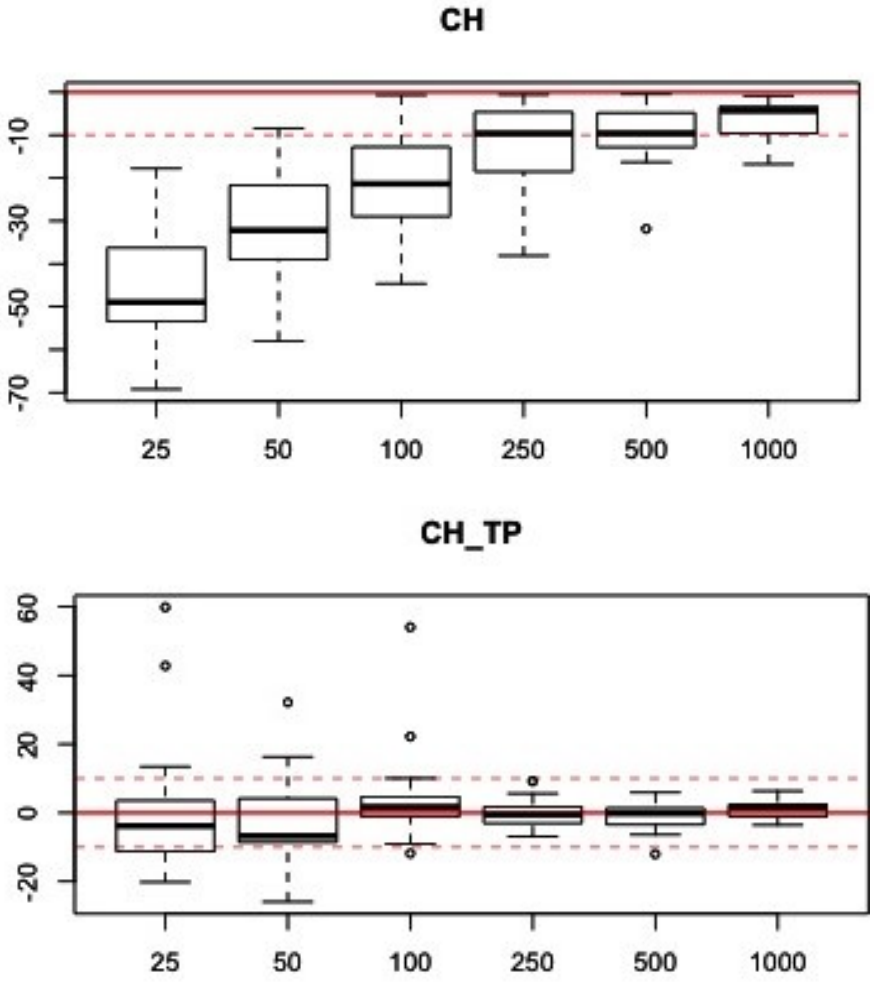
Birds of North America(27 species)



Birds of Colombia (125 species)

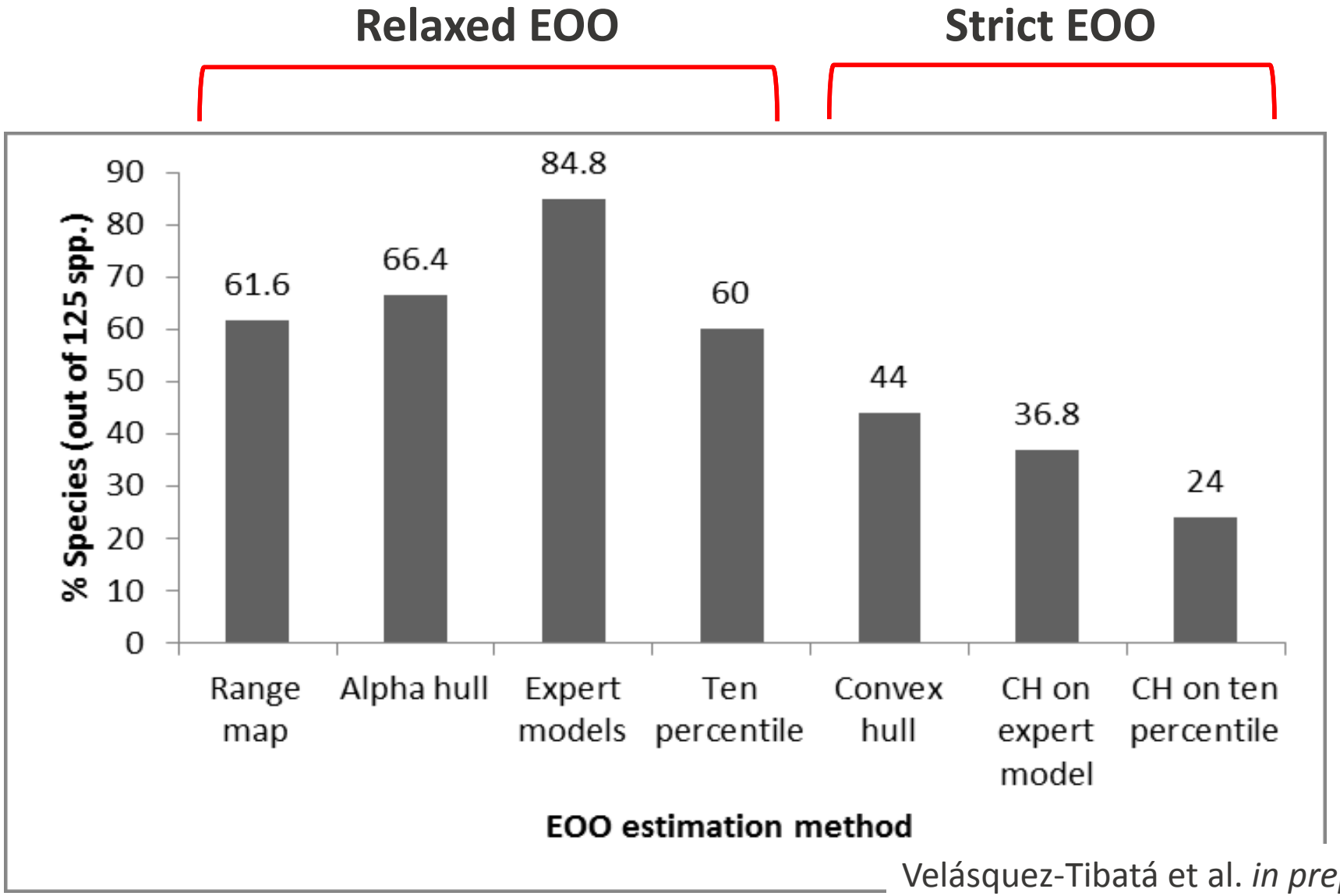


¿What is the most precise method to measure extent of occurrence?



Velásquez-Tibatá et al. *in prep.*

¿What are the consequence of using different methods for measuging EOO?



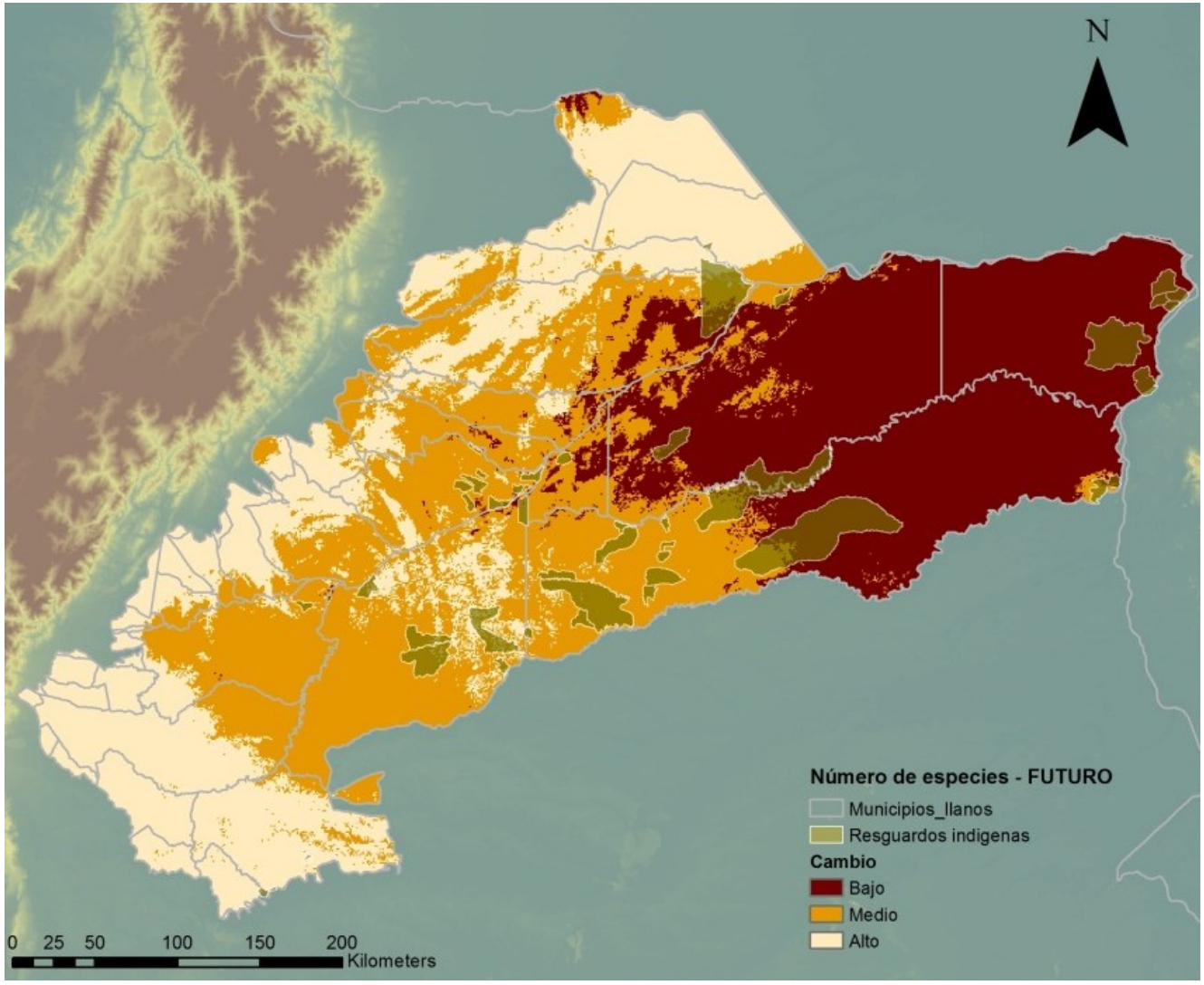
Velásquez-Tibatá et al. *in prep.*

Mapping provisioning ecosystem services under climate change scenarios

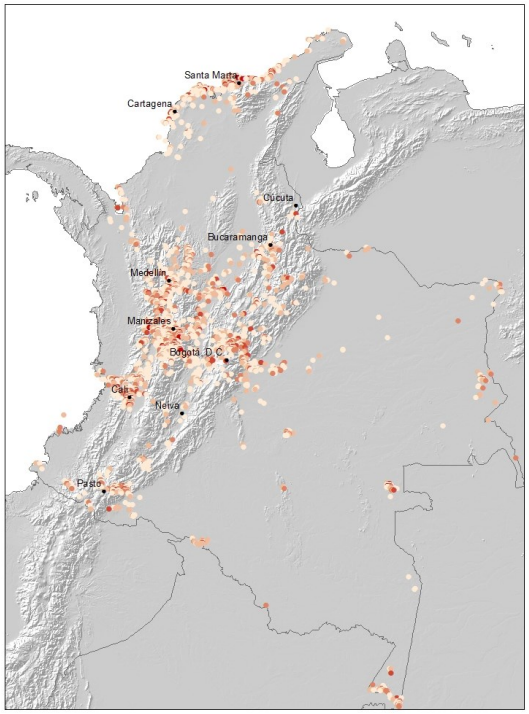
Offer of provisioning ecosystem services

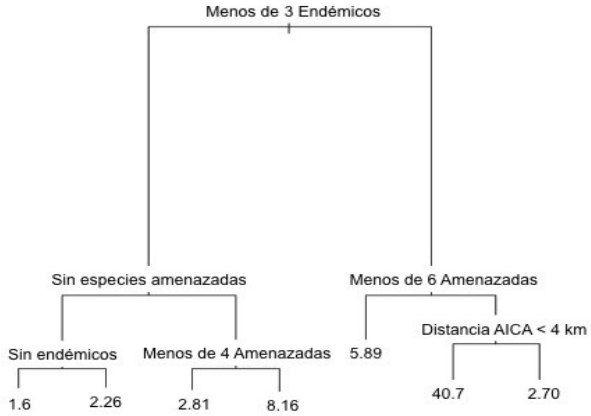
1577 species offer provisioning ecosystem services (food or cultural)

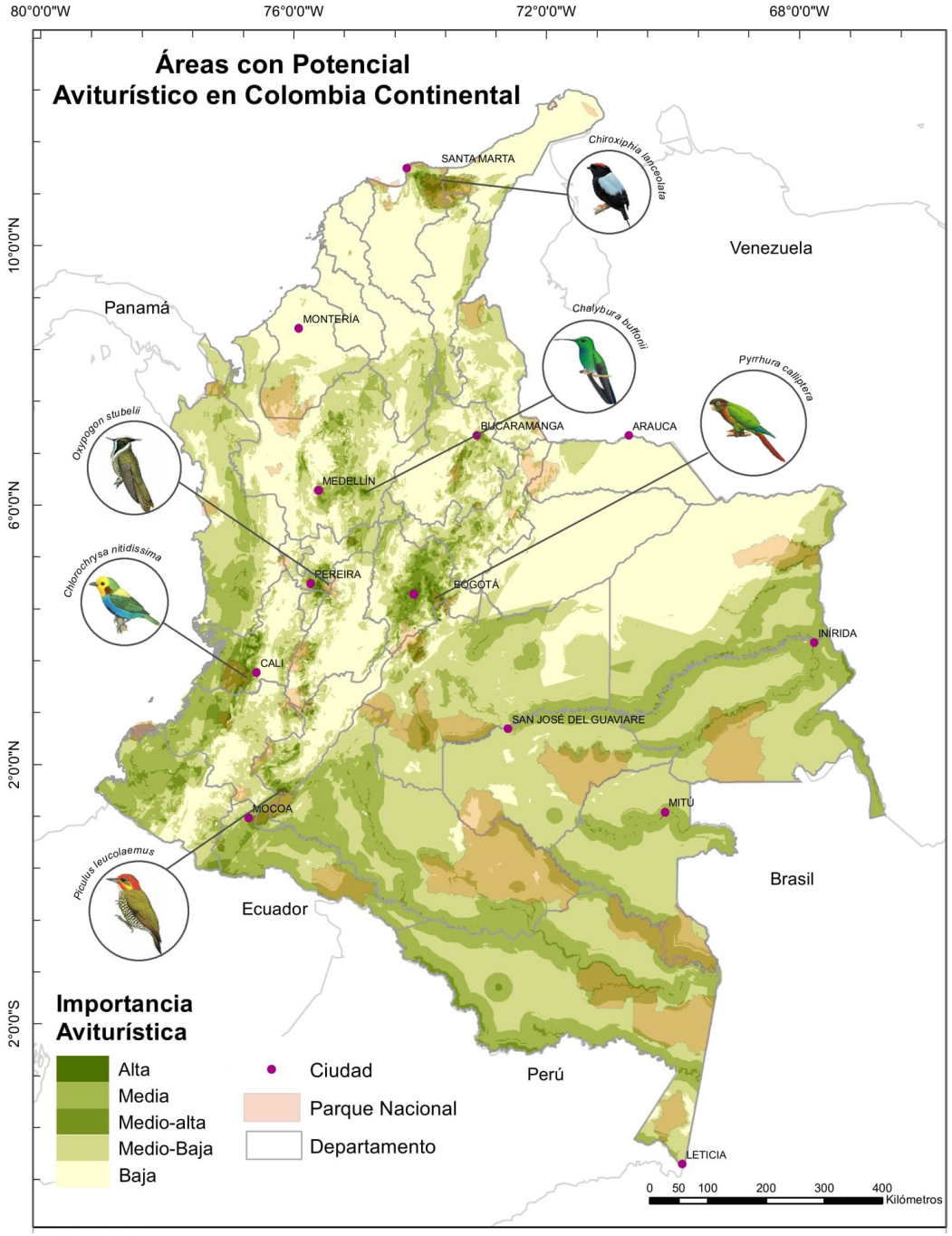
142 Species with sufficient information for SDM development.



Mapping the nature tourism potential in post-conflict Colombia


Santa Marta
Cartagena
Cucuta
Bucaramanga
Medellin
Manizales
Bogota, D.C.
Cali
Neiva
Pasto


Menos de 3 Endémicos
Sin especies amenazadas
Menos de 6 Amenazadas
Sin endémicos
Menos de 4 Amenazadas
5.89
Distancia AICA < 4 km
1.6
2.26
2.81
8.16
40.7
2.70


Áreas con Potencial
Aviturístico en Colombia Continental
80°0'0"W
76°0'0"W
72°0'0"W
68°0'0"W
10°0'0"N
6°0'0"N
2°0'0"N
2°0'0"S
SANTA MARTA
Chiroxiphia lanceolata
Venezuela
Panamá
MONTERÍA
Chalybura buffonii
Pyrrhura calliptera
Oxypogon stubelii
BUCARAMANGA
ARAUCA
MEDELLÍN
Chlorochrysa nitidissima
PEREIRA
BOGOTÁ
INÍRIDA
CALI
SAN JOSÉ DEL GUAVIARE
MOCOA
MITÚ
Piculus leucolaemus
Brasil
Ecuador
Perú
LETICIA
Importancia
Aviturística
Alta
Media
Medio-alta
Medio-Baja
Baja
Ciudad
Parque Nacional
Departamento
0 50 100 200 300 400
Kilómetros

Other research areas

1. Error propagation in species distribution models.
2. Formal incorporation of expert opinion in species distribution models.
3. Development of a biodiversity indicators dashboard.
4. Integration of presence-only and presence-absense data in regional species distribution models.
5. Development of a global indicator for Aichi goal 13
6. Integration of RS data in SDMs
7. Development of software for the calculation of parameters to aid IUCN risk assessments.

American Museum of Natural History
Center for Biodiversity and Conservation
The City College of New York
CUNY The City University of New York
Pace University
Yale

Expanding `wallace` biodiversity modeling software to support national biodiversity change indicator calculations for GEO BON assessment and reporting

We will expand the open-source species distribution modeling software `wallace` as a tool for BON in a Box by:

1. Developing two new R packages to calculate biodiversity change indicators using NASA Earth Science data & adding them to `wallace` as modules
2. Integrating `wallace` with BioModelos
3. Increasing ease of use with a Conservation Practitioner Dashboard
4. Creating interactive web-based training and workshop materials

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THANK YOU

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