Species Distribution Modeling of Threatened Bats in Global Biodiversity Hotspots

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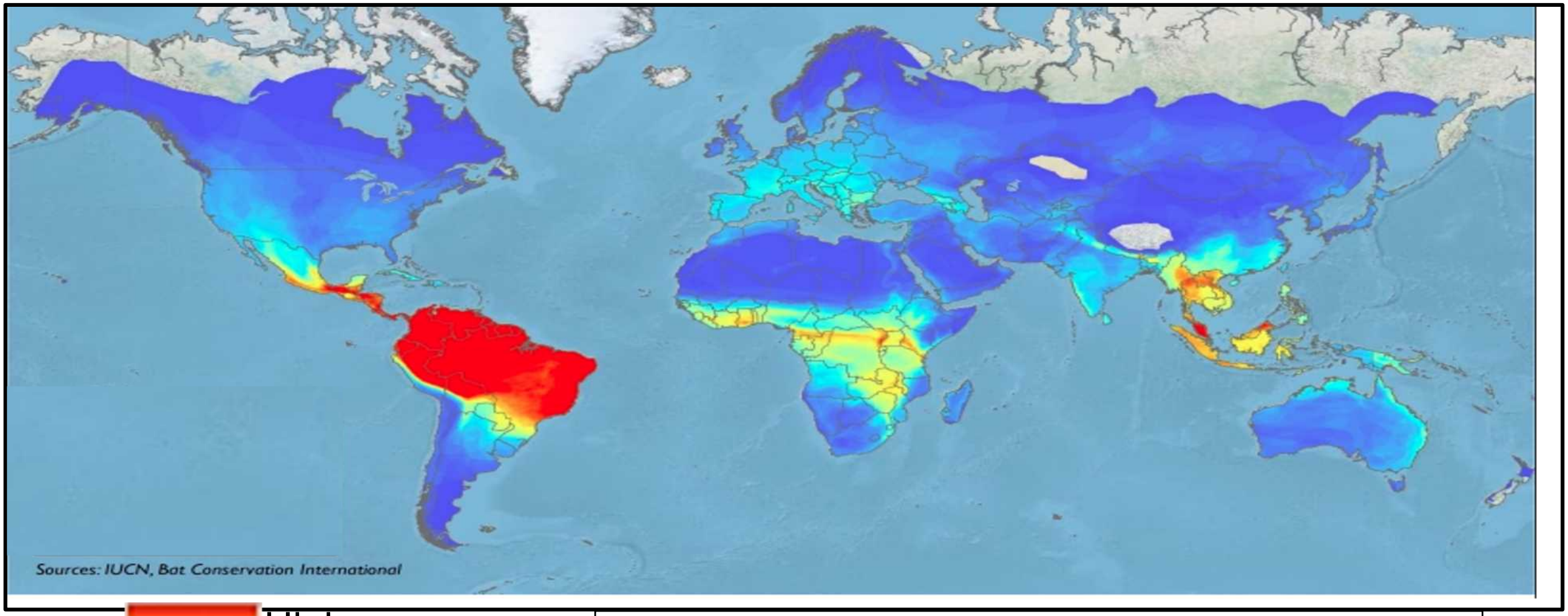
Bats are everywhere

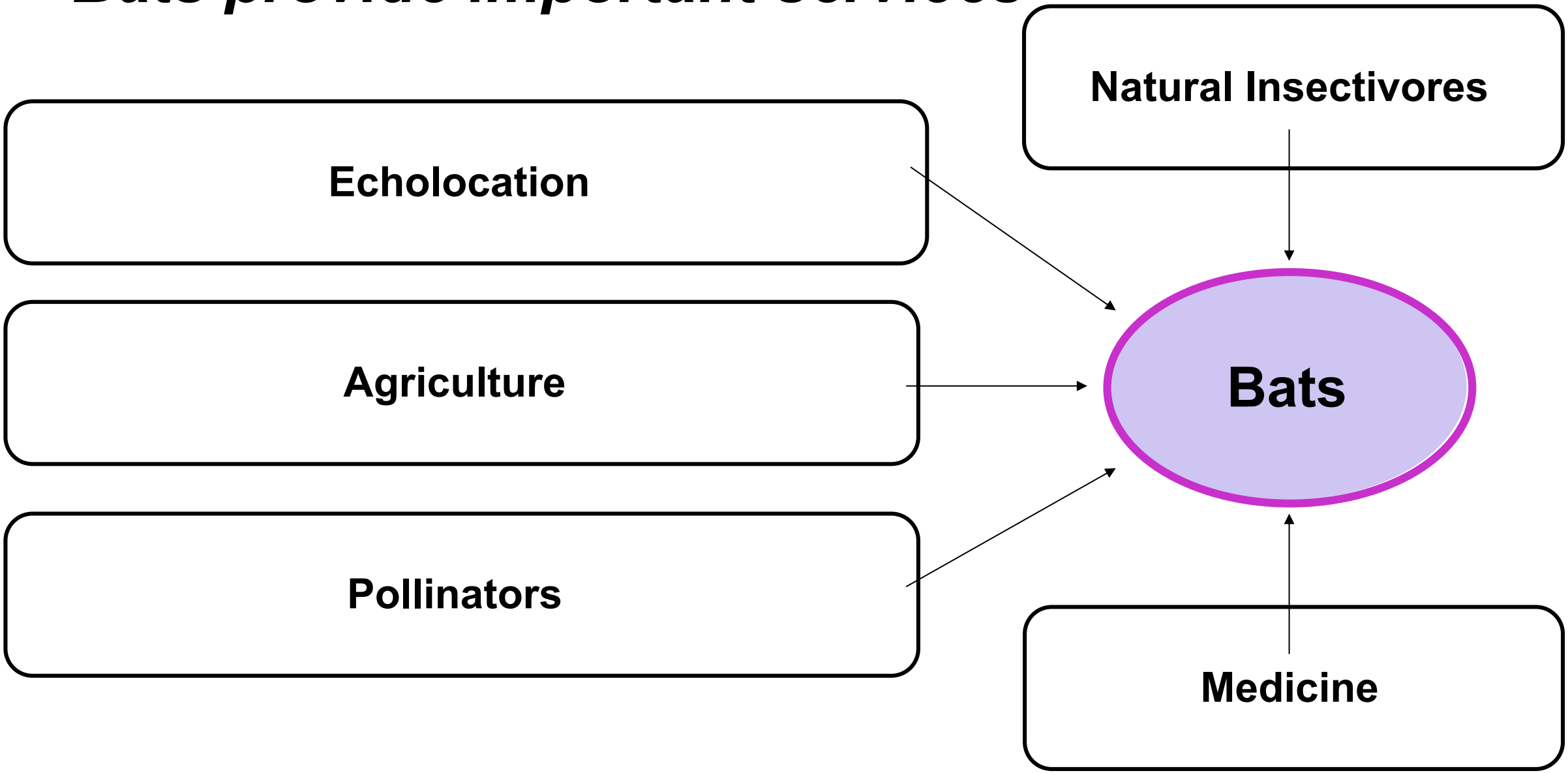


High

Low

Bats make up over **one-fifth** of all mammals on earth

Bats provide important services



Compared to other mammals and birds, bats are the most data-deficient species

Small geographic range

Native to Islands

Why are bats so data-deficient?

Bats are faced with a number of threats

White-nose syndrome

Building and development work

Habitat loss

Photo credit: Bat Conservation

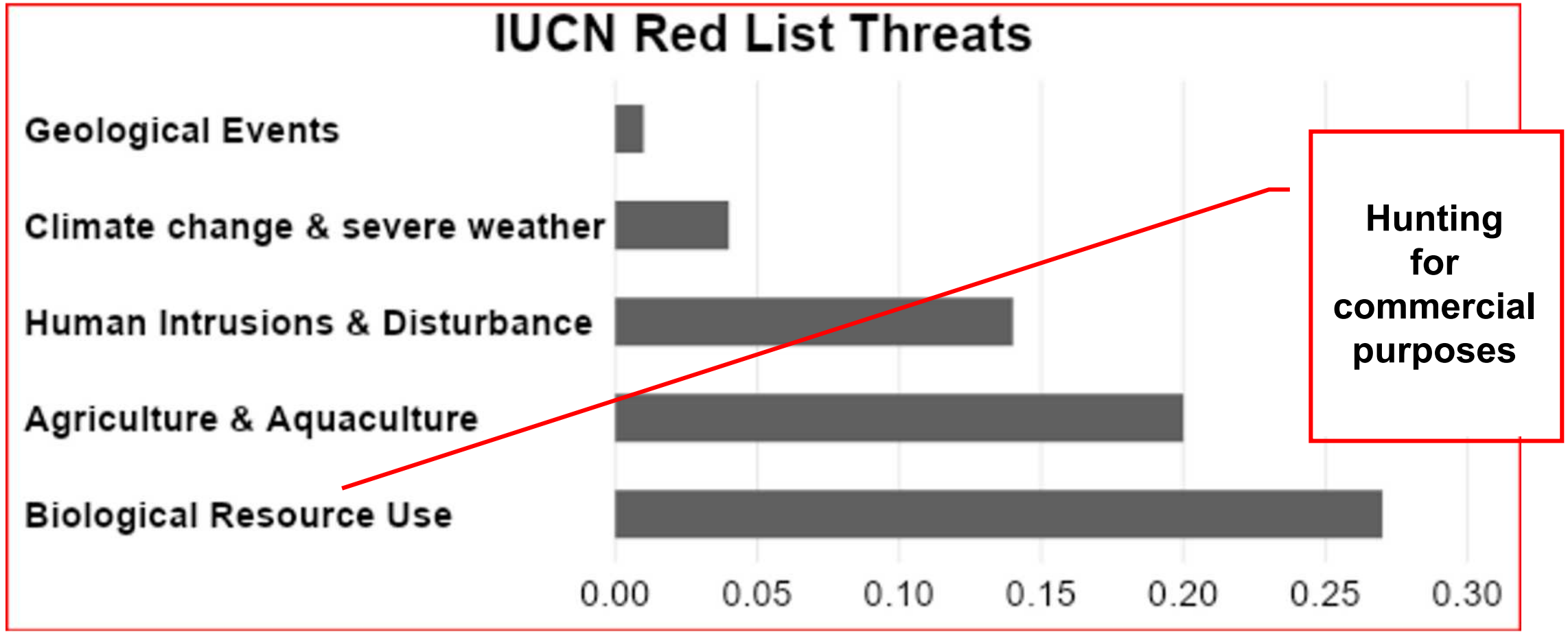
Wind farms and wind turbines

Roads

Other threats

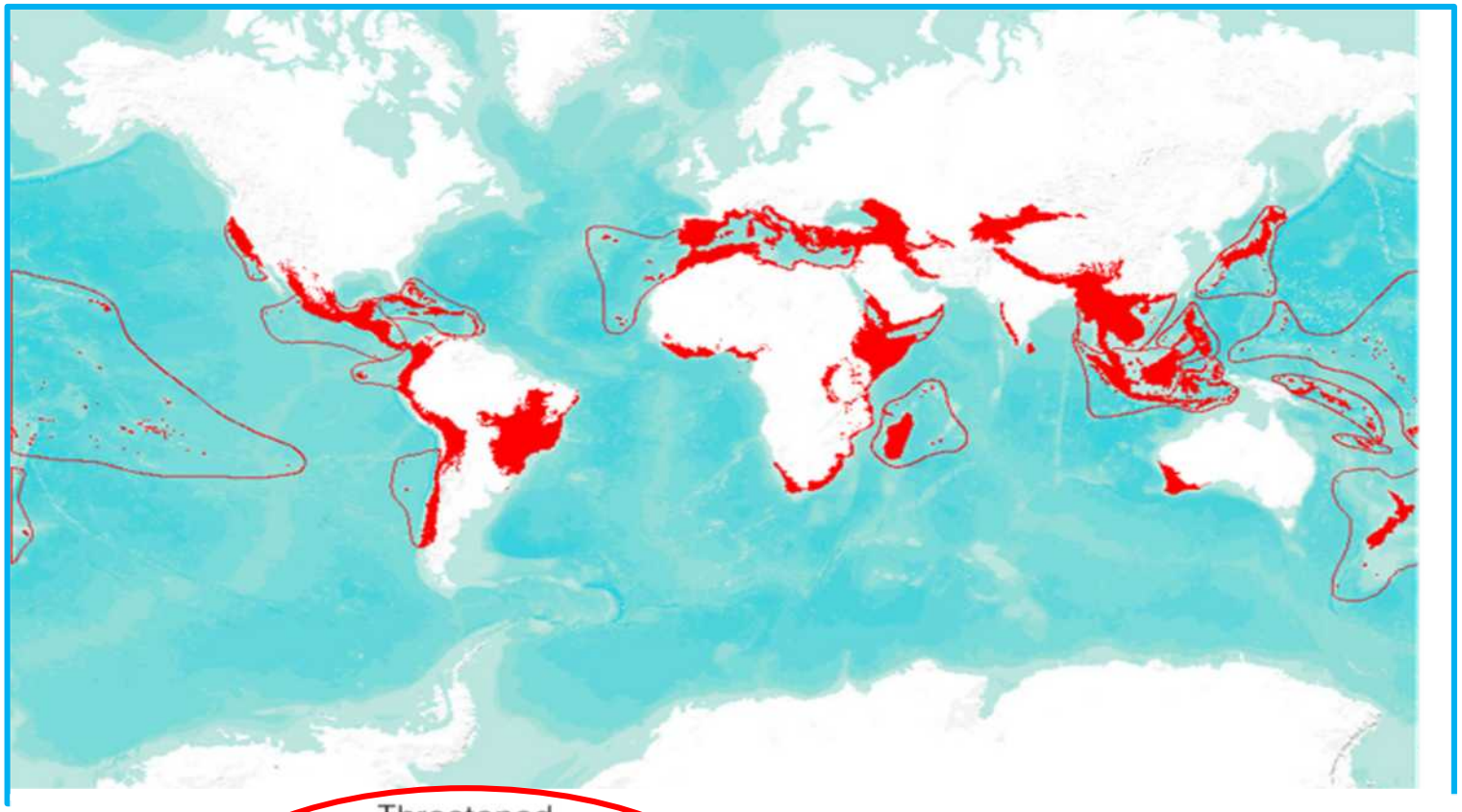
Photo credit: Bat Conservation Trust

Biological Resource Use is the number one threat to bats



Source: IUCN Red List

Bats are the most threatened in Global Biodiversity Hotspots



Critically Endangered

Endangered

Vulnerable

Source: IUCN

To qualify as a Biodiversity Hotspot there are two criteria:

It must have **at least 1,500 vascular plants as endemics** — which is to say, it must have a high percentage of plant life **found nowhere else on the planet.**

It must have **30% or less of its original natural vegetation**.

Source: Conservation International

There are 5 hotspots that contain ranges for Endangered Bats

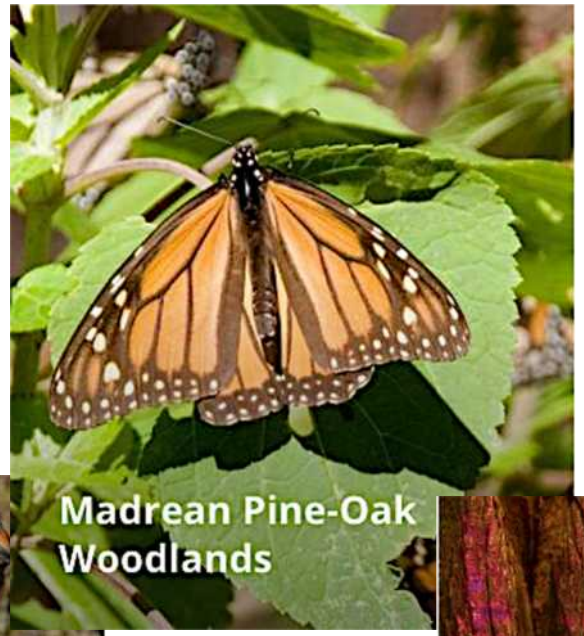
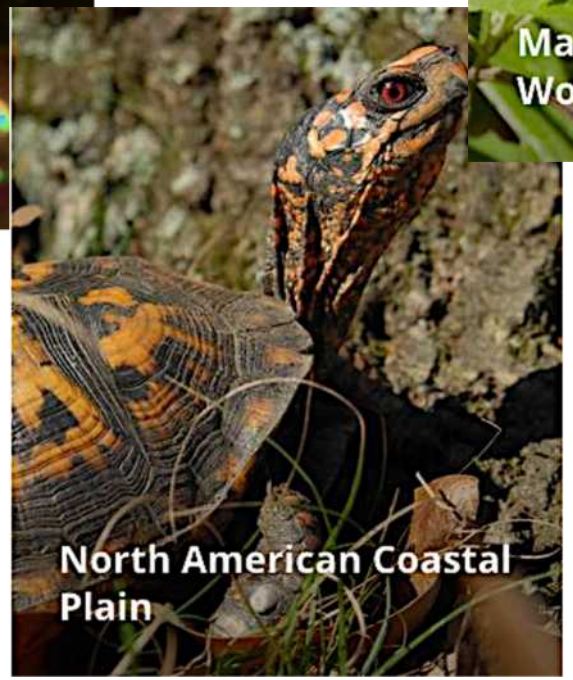
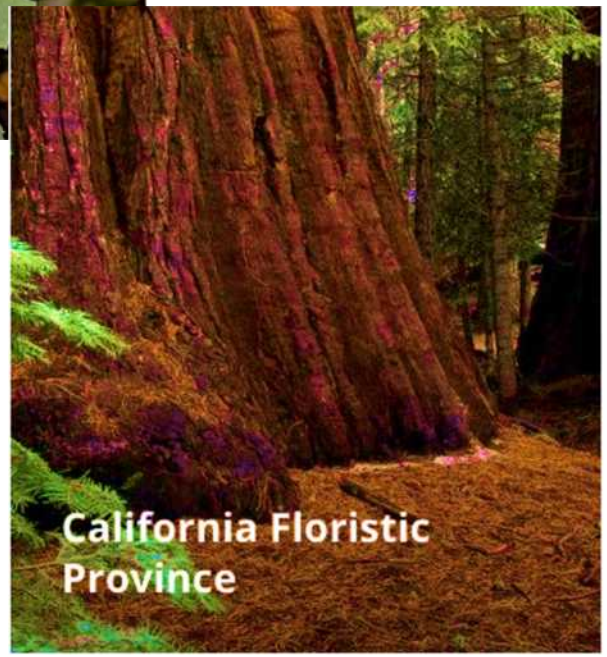
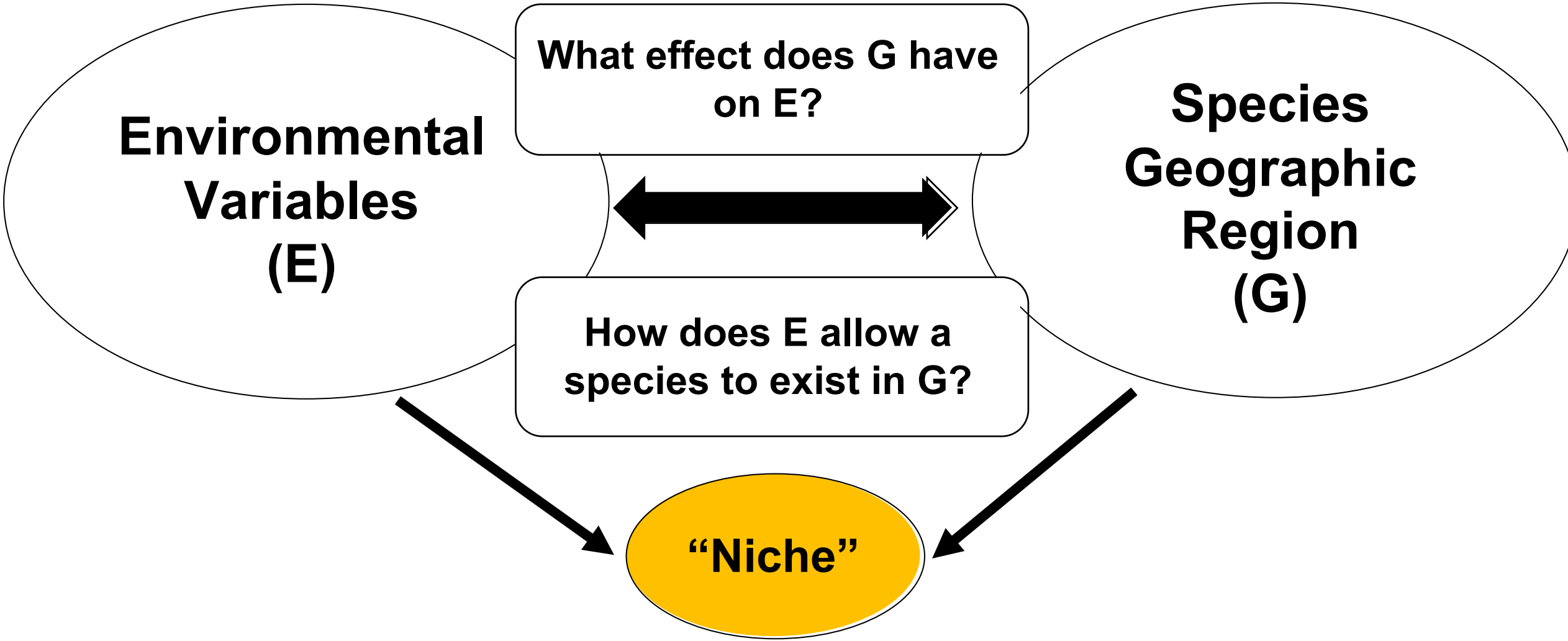


Photo credit: CEPF





Species Distribution Modeling (SDM) is an important tool used to predict bat distributions



SDM identifies environments associated with species occurrence

Climate Change
Deforestation

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Occurrence
Data

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Prediction
of
Species
Distribution

Discrete
Data

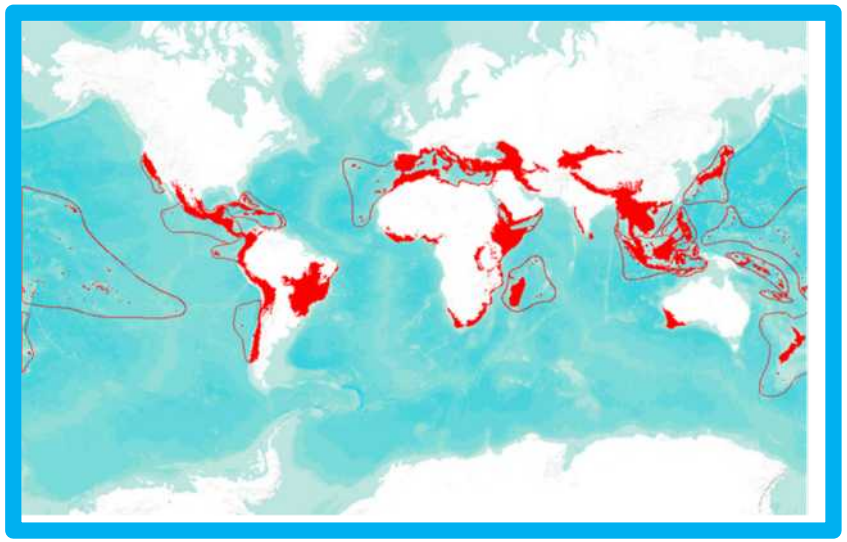
Continuous
Data

Lakes
Boundaries
Counties

Leaf Area Index
Elevation
Rainfall Depth

Hotspots

Question 1: How will climate change and deforestation affect bat species richness in 5 biodiversity hotspots?



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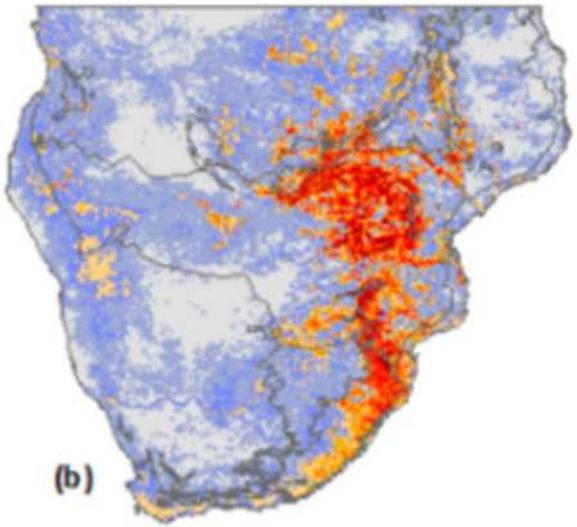
Species Richness Maps



Question 2: What global areas have a high prioritization for conservation based on future climate scenarios?

Critically Endangered

Endangered

Vulnerable

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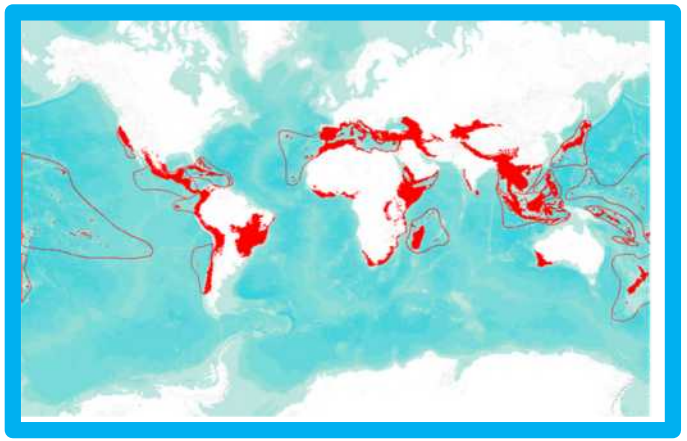

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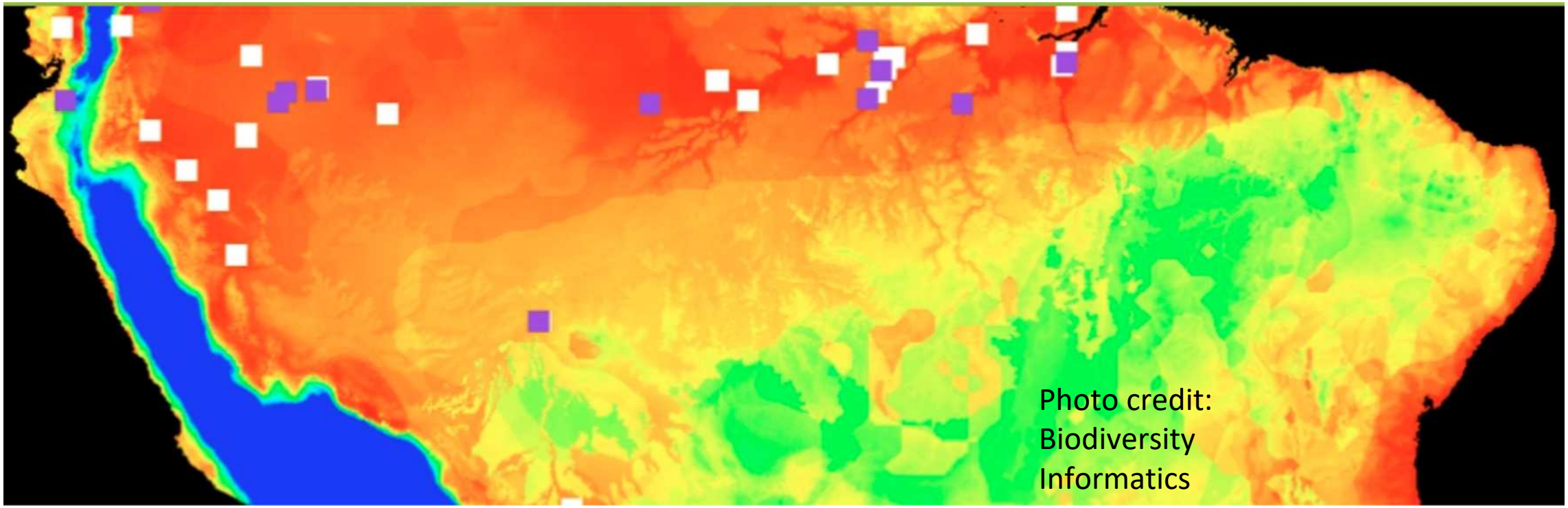
Occurrence data

A	B	C	D	E	F	G	H
	key	scientificNar	redlistCateg	decimalLatit	decimalLong	lastID	lastdate
1	1562883118	Acerodon cel	Vulnerable	-0.739148	123.285849	Peters	1867
2	859369211	Acerodon cel	Vulnerable	1.133333	119.566667	Peters	1867
3	859418176	Acerodon cel	Vulnerable	-1.116667	119.566667	Peters	1867
4	2285933904	Acerodon cel	Vulnerable	-5.002222	119.575556	Peters	1867
5	1987356008	Acerodon leu	Vulnerable	10	118.54	Sanborn	1950

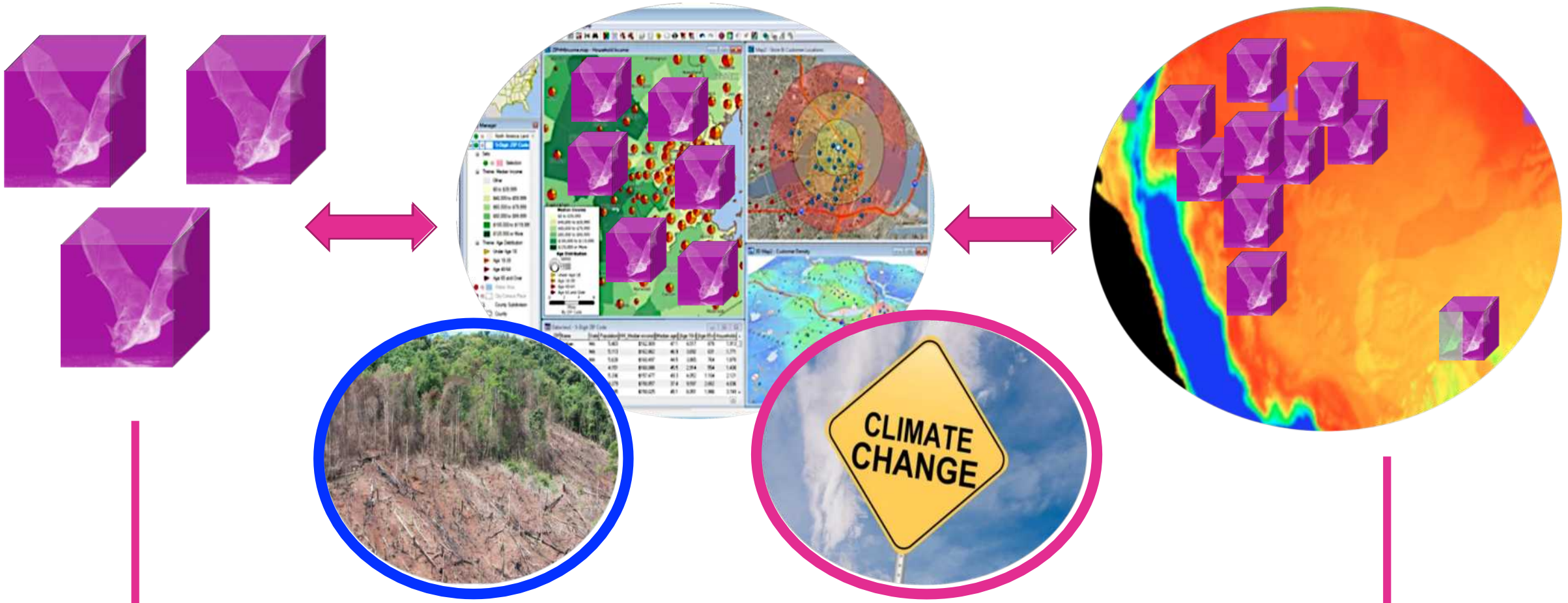
GBIF Global Biodiversity Information Facility

MaxEnt = Maximum Entropy Modeling

- A computer modeling program to predict future distributions of species



The modeling concept



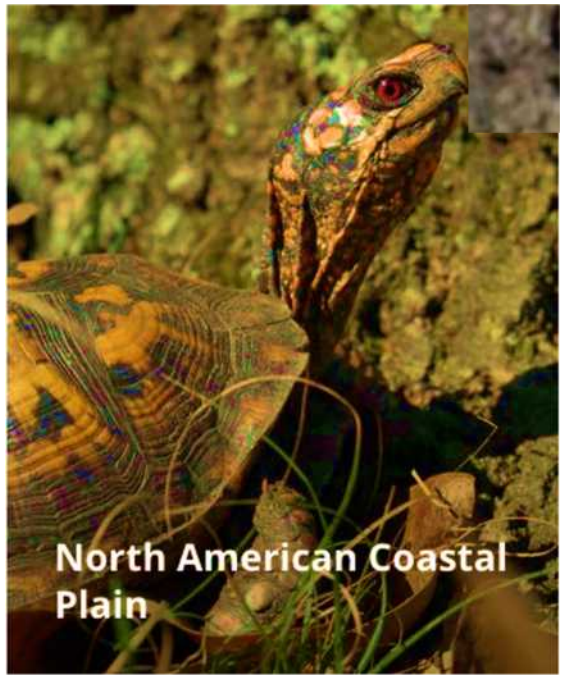
Predicted distribution

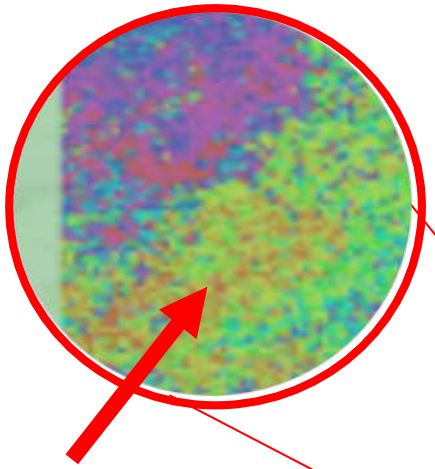
Case Study: Myotis leibii
Eastern Small-footed Myotis

- *One of the **rarest** bats in North America*
- *Roosts in forests*
- *Current classification by IUCN: **Endangered, population Decreasing***
- ***Main threats: Urban development, Agriculture, Mining/Quarrying, Human Disturbances***

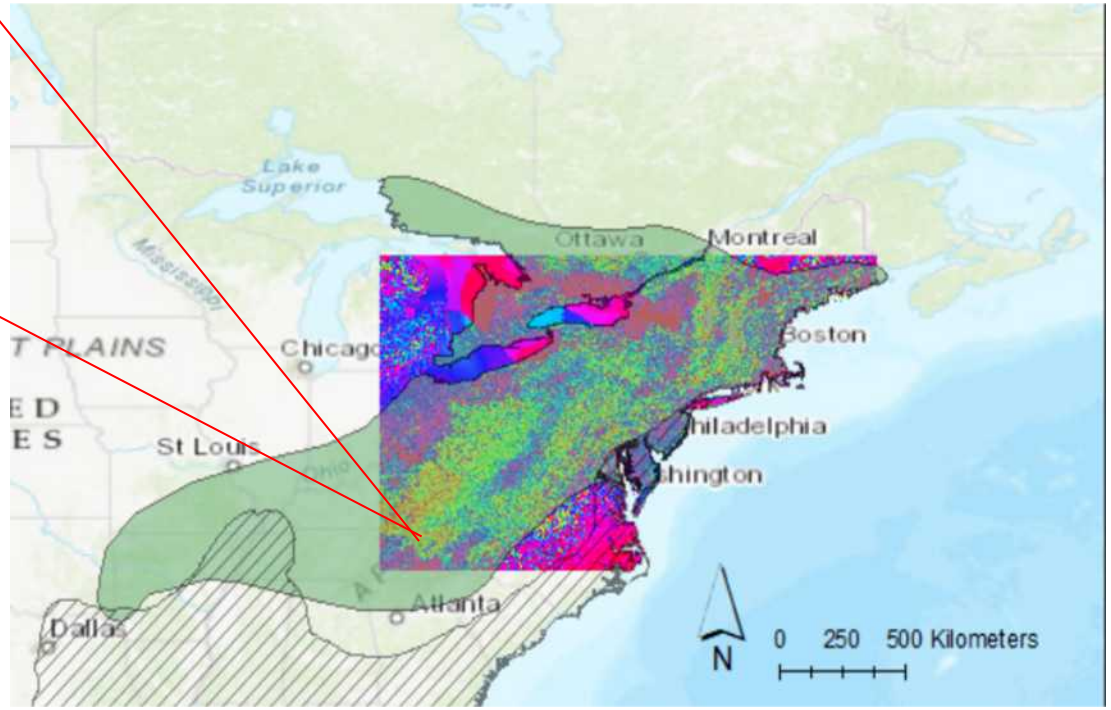
Geographic Range:

Hatched area:





High Probability of species distribution



Some variables contribute more than others to model performance

Variable	Percent contribution	Permutation importance
slope	26.5	23.9
ndvi1	21.5	3.5
bio8	14.6	34.9

In short

- *Bats are important creatures in our ecosystem.*
- *Increased occurrence data increases predictive modeling.*
- *Knowing future carbon emission scenarios in 2050, 2070 and 2100 will increase model performance.*

Thank you!

Photo credit:
NPS/Morgan Ingalls