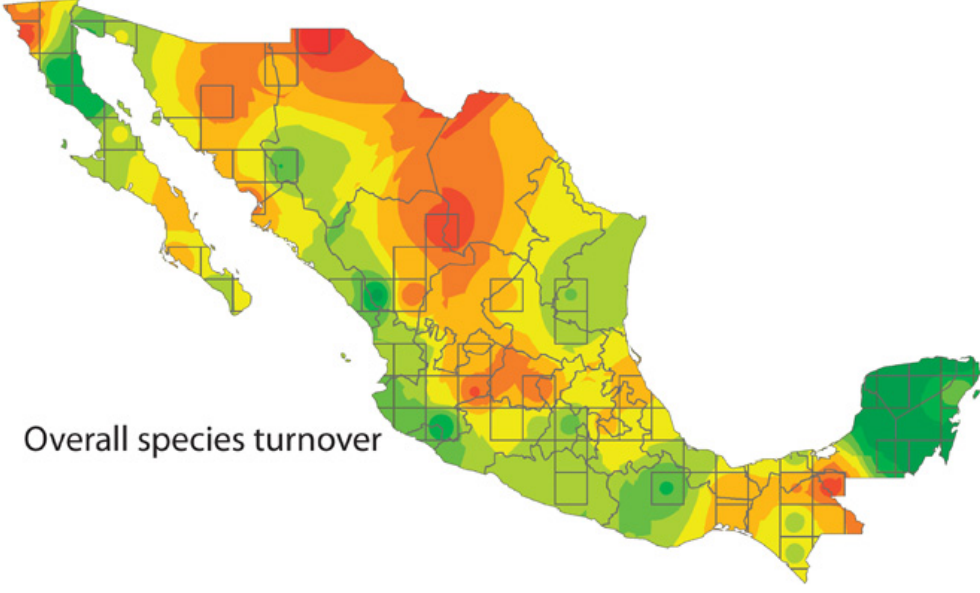
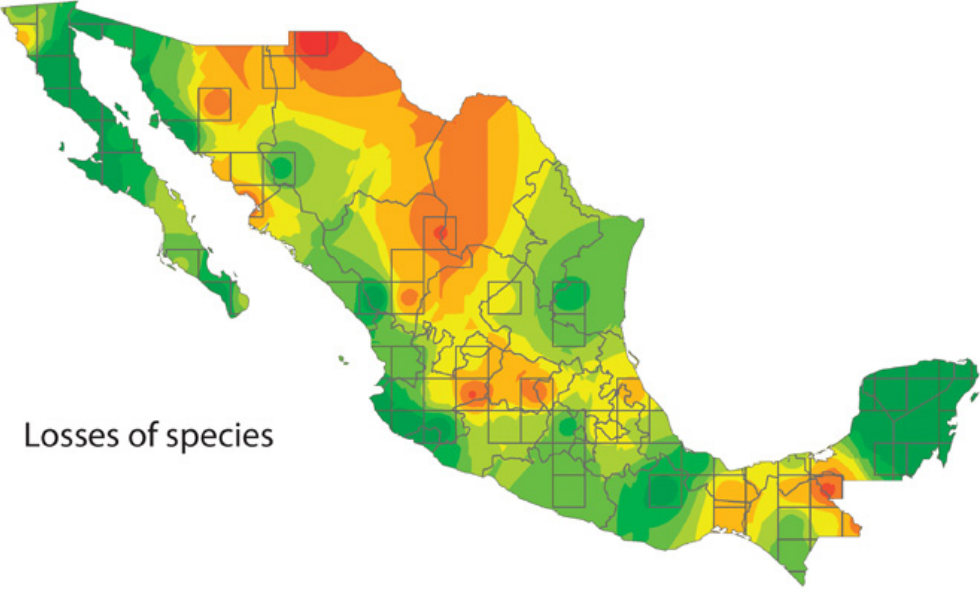
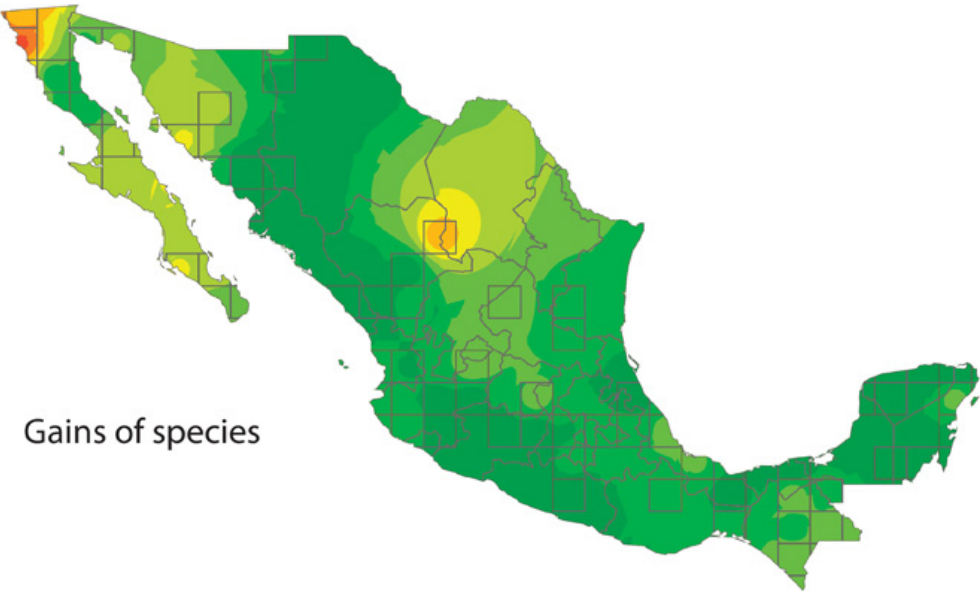


Temperature a dominant influence on bird diversity loss in Mexico

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Researchers map current distributions with distributions in the middle 20th century for 115 bird species that are found only in Mexico. They then compared those bird community changes to patterns of change in climate and land use. Credit: KU News Service | University of Kansas

A wide-ranging study of gains and losses of populations of bird species across Mexico in the 20th century shows shifts in temperature due to global climate change are the primary environmental influence on the distributions of bird species.

"Of all drivers examined ... only [temperature change](#) had significant impacts on avifaunal turnover; neither precipitation change nor human impacts on landscapes had significant effects," wrote the authors of the study, which appeared recently in the peer-reviewed journal *Science Advances*.

Using analytical techniques from the field of biodiversity informatics, researchers compared current distributions with distributions in the middle 20th century for 115 bird species that are found only in Mexico. They then compared those bird community changes to patterns of change in climate and land use.

"We assessed which places appear to have lost which species," said lead author A. Townsend Peterson, university distinguished professor of ecology & evolutionary biology at the University of Kansas and senior curator at KU's Natural History Museum and Biodiversity Institute.

"We picked out places that were well-characterized with data," he said. "Once we did a dissection of what was lost where, we analyzed what

could be driving those changes. We got summaries of how much temperature, rainfall and land use had changed across the country, and that was a very interesting result because avifaunal changes were associated with temperature change only."



More than rainfall or land-use change, a University of Kansas study shows temperature drives changing bird populations in Mexico. Credit: KU News Service | University of Kansas

The researchers created detailed maps based on data about bird occurrences in Mexico from two key sources. More than 330,000 records of historical bird occurrences were drawn from the Atlas of Distributions of Birds of Mexico project collected mostly from 1920 to

1950.

"The historical data is pretty unique to Mexico," Peterson said. "It comes from specimens in natural history museums from around the world—64 museums everywhere from Russia to Mexico to KU. But we've spent years improving the data, adding geo-references, adding and checking identification and doing other checks to be confident in the data. The old 'Birds of Mexico' data set is pretty unique. There aren't very many countries that have that comprehensive a data set encompassing a major taxon like birds."

Peterson and his colleagues also considered 890,000 records of bird occurrences collected since 2000 by citizen scientists and deposited in the aVerAves database.

The researchers related the changes in bird populations to land-use patterns using the Global Human Influence Index, a data set that includes population density and other measures of people's influence on natural areas through land use, building, roads, nighttime lights and other factors. They also explored information captured by hundreds of weather stations documenting [climate change](#) across Mexico in the latter half of the 20th century, focusing on temperature and rainfall.

According to Peterson, the researchers suspected temperature fluctuations caused by [global climate change](#) would be a key driver determining bird community change in the temperate zone, but they were surprised that it was the prevailing factor in a tropical area like Mexico.

"Birds are making sure they have space and time and resources to carry out their life cycle—the real name of the game is reproduction," he said. "In the temperate zone, birds are waiting until it's just warm enough to start the nesting cycle. They're timing breeding so they'll have young in

nests right when they have maximum food available. But in the tropical world, it's always a pleasant temperature for birds, so I'd imagined precipitation might have had more of an effect."

Overall, among [bird species](#) endemic to Mexico, numbers of losses greatly outweighed gains, the study showed. The research found "relatively few" gains of species, mainly in the central-northern Chihuahuan Desert and in the northwestern Baja California along the border with the U.S. state of California.

Peterson said the findings should provide some useful information to Mexican environmental policymakers.

"When you design protected areas, like national parks or biospheres for biodiversity conservation, that design needs to take into account how climates are changing," he said. "They've done major planning, more than in the U.S., for present-day distributions of species. But climate change must be taken into account because those distributions are changing."

More information: — ebird.org/content/averaves/?lang=en

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Provided by University of Kansas

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