Protecting 17 percent of Earth's land could save two-thirds of plant species

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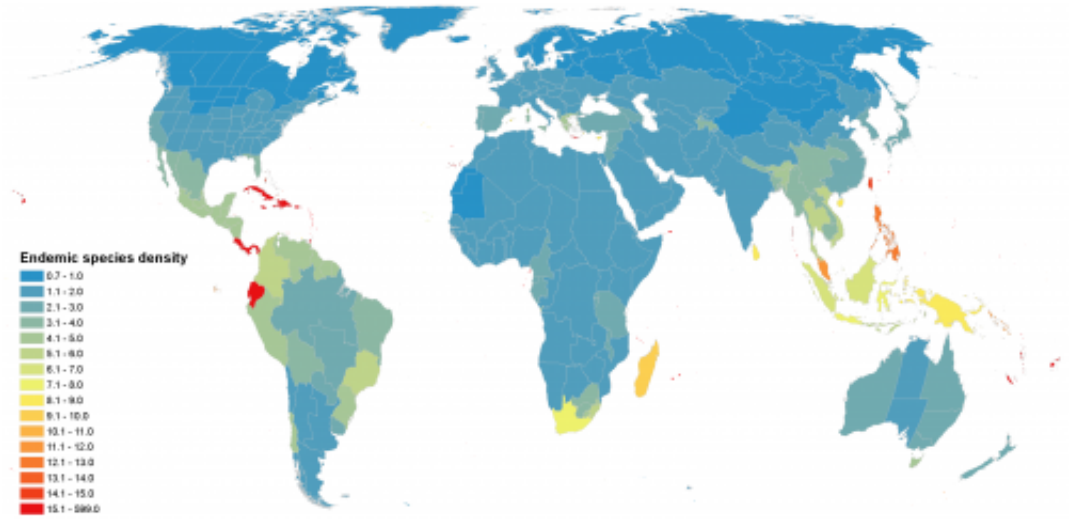

This world map shows where the greatest concentrations of endemic native vegetation may still be found. Red, orange and yellow are highest concentrations. Darkest blue is lowest. Credit: Clinton Jenkins, NC State University

Protecting key regions that comprise just 17 percent of Earth's land may help preserve more than two-thirds of its plant species, according to a new Duke University-led study by an international team of scientists.

The researchers from Duke, North Carolina State University and Microsoft Research used computer algorithms to identify the smallest set of regions worldwide that could contain the largest numbers of plant species. They published their findings today in the journal *Science*.

"Our analysis shows that two of the most ambitious goals set forth by the 2010 Convention on Biological Diversity—to protect 60 percent of Earth's plant species and 17 percent of its land surface—can be achieved, with one major caveat," said Stuart L. Pimm, Doris Duke Professor of Conservation Ecology at Duke's Nicholas School of the Environment.

"To achieve these goals, we need to protect more land, on average, than we currently do, and much more in key places such as Madagascar, New Guinea and Ecuador," Pimm said. "Our study identifies regions of importance. The logical—and very challenging—next step will be to make tactical local decisions within those regions to secure the most critical land for conservation."

Plant species aren't haphazardly distributed across the planet. Certain areas, including Central America, the Caribbean, the Northern Andes and regions in Africa and Asia have much higher concentrations of endemic species, that is, those which are found nowhere else.

"Species endemic to small geographical ranges are at a much higher risk of being threatened or endangered than those with large ranges," said Lucas N. Joppa, a conservation scientist at Microsoft Research's Computational Science Laboratory in Cambridge, U.K. "We combined regions to maximize the numbers of species in the minimal area. With that information, we can more accurately evaluate each region's relative importance for conservation, and assess international priorities accordingly."

To identify which of Earth's regions contain the highest concentrations of endemic species, relative to their geographic size, the researchers analyzed data on more than 100,000 different species of flowering plants, compiled by the Royal Botanic Gardens in Kew, England.

Joppa and Piero Visconti, also of Microsoft Research's Computational Science Laboratory, created and ran the complex algorithms needed to analyze the large spatial database.

Based on their computations, Clinton N. Jenkins, a research scholar at North Carolina State University, created a color-coded global map identifying high-priority regions for plant conservation, ranked by endemic species density.

"We also mapped where the greatest numbers of small-ranged birds, mammals and amphibians occur, and found that they are broadly in the same places we show to be priorities for plants," Jenkins said. "So preserving these lands for plants will benefit many animals, too."

Without having access to the Royal Botanic Gardens' plant database, which is one of the largest biodiversity databases in the world, the team would not have been able to conduct their analysis, said Joppa, who received his Ph.D. in ecology from Duke in 2009.

Pimm and Jenkins lead the conservation nonprofit Saving Species, http://www.savingspecies.org., which works with local communities and international agencies to purchase and protect threatened lands that are critical for biodiversity.

"The fraction of land being protected in high-priority regions increases each year as new national parks are established and greater autonomy is given back to indigenous peoples to allow them to manage their traditional lands," Pimm said. "We're getting tantalizingly close to achieving the Convention of Biological Diversity's global goals. But the last few steps remaining are huge ones."

More information: "Achieving the Convention on Biological Diversity's Goals for Plant Conservation," Lucas Joppa, Piero Visconti,

Clinton N. Jenkins, Stuart L. Pimm. *Science*, Sept. 5, 2013

Provided by Duke University