

# When and where to protect forests

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Researchers at the University of Minnesota and the University of Colorado Boulder developed a mathematical model to determine what forests should be prioritized for conservation investments to protect species and reduce extinction risks.

In an article published today in *Nature*, the authors explained how they applied the model to optimally allocate a limited conservation budget

across 458 [forest](#) ecoregions over a 50-year horizon.

"We are rapidly losing forests in parts of the world that have rich biodiversity. Our research shows that allocating limited conservation funds to first protect areas with little remaining forest, high biodiversity and relatively low cost of protection can save many [species](#) from extinction," said Stephen Polasky, Ph.D., a professor in the Department of Applied Economics.

The researchers identified where forest conservation dollars should be prioritized by analyzing global data on plant biodiversity, forest land, rates of deforestation and the cost of conservation in various locations.

Their model accounts for species that live in multiple ecoregions, the opportunity to spend on both protection and reforestation, and conservation costs that may rise as competing uses for remaining forest intensify.

The researchers found:

- Conservation spending in the near term should be concentrated in a small number of priority ecoregions.
- Those regions, primarily in the tropics, offer the opportunity to protect a large number of species at a comparatively low cost.
- The cost of conservation matters more than the threat of deforestation when deciding where to spend conservation dollars. Priorities should be driven primarily by the benefit-to-cost ratio that different ecoregions offer, while rates of deforestation play a secondary role.

Many of the highest priority ecoregions for conservation are in [lower-income](#) tropical areas in Melanesia, South and Southeast Asia, South America and Central America. These locations have an abundance of

biodiversity but are often located in countries that are financially poorer than most. Substantial international funding to conserve and restore forests is needed.

"It is important to consider both when and where to conserve. Deforestation causes loss of habitat for forest-dependent species. Once a species is extinct it cannot be brought back to life. Our research finds an approach that minimizes extinction risks by considering both what regions are most important to conserve and what regions are most important to conserve first," said Ian Luby, lead author and former University of Minnesota graduate student, now with the U.S. Geological Survey.

These recommendations are relevant to ongoing international negotiations to protect [biodiversity](#). For example, at the upcoming meeting of the Convention on Biological Diversity, world leaders are expected to adopt the Post-2020 Global Biodiversity Framework that will shape conservation planning for the next decade. Forward-looking conservation plans that incorporate biological benefits, [economic costs](#) and threats can protect thousands of additional species within existing levels of conservation spending. This approach could also be usefully applied at a smaller scale to offer actionable [conservation](#) guidance at regional scales.

**More information:** Ian H. Luby et al, When and where to protect forests, *Nature* (2022). [DOI: 10.1038/s41586-022-05096-z](https://doi.org/10.1038/s41586-022-05096-z)

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