

Restoring 30% of the world's ecosystems in priority areas could stave off extinctions and absorb CO₂

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Returning specific ecosystems that have been replaced by farming to their natural state in all continents worldwide would rescue the majority

of land-based species of mammals, amphibians and birds under threat of extinction. Such measures would also soak up more than 465 billion tons of carbon dioxide, according to a new report released today. Protecting 30% of the priority areas identified in the study, together with protecting ecosystems still in their natural form, would reduce carbon emissions equivalent to 49% of all the carbon that has built up in our atmosphere over the last two centuries. Some 27 researchers from 12 countries contributed to the report, which assesses forests, grasslands, shrublands, wetlands and arid ecosystems.

"Pushing forward on plans to return significant sweeps of nature to a natural state is critical to preventing ongoing biodiversity and climate crises from spinning out of control," said Bernardo B. N. Strassburg, the lead author of "[Global priority areas for ecosystem restoration](#)," published in *Nature* today. "We show that if we're smarter about where we restore nature, we can tick the climate, biodiversity and budget boxes on the world's urgent to-do list."

By identifying precisely which destroyed [ecosystems](#) worldwide should be restored to deliver biodiversity and climate benefits at a low cost without impact on [agricultural production](#), the study is the first of its kind to provide global evidence that where restoration takes place has the most profound impact on the achievement of biodiversity, climate and food security goals. According to the study, restoration can be 13 times more cost-effective when it takes place in the highest priority locations.

In a first, the study focuses on the potential benefits of restoring both forest and non-forest ecosystems on a global scale. "Previous research has emphasized forests and tree planting, sometimes at the expense of native grasslands or other ecosystems, the destruction of which would be very detrimental for biodiversity and should be avoided. Our research shows that while reviving forests is critical for mitigating global warming

and protecting biodiversity, other ecosystems also have a massive role to play," said Strassburg.

The new report in *Nature* builds on the U.N.'s dire warnings that we're on track to lose 1 million species in coming decades and that the world has mostly failed in its efforts to reach globally set biodiversity targets in 2020, including the goal to restore 15% of ecosystems worldwide. Nations are redoubling efforts to stave off mass extinctions in the leadup to the Convention on Biological Diversity COP15 in Kunming, China, in 2021, when a global framework to protect nature is expected to be signed. The new *Nature* report, which includes a co-author from the CBD, will inform the discussion around restoration and offer insight into how reviving ecosystems can help tackle multiple goals.

Using mapping technologies and a sophisticated multi-criteria optimization platform called PLANGEA, a mathematical approach that finds "slam dunk" solutions to address multiple problems, the researchers assessed 2,870 million hectares of ecosystems worldwide that have been converted to farmland. Of these, 54% were originally forests, 25% grasslands, 14% shrublands, 4% arid lands and 2% wetlands. They then evaluated these lands based on three factors, or objectives (animal habitats, carbon storage and cost-effectiveness) to determine which swathe—whether it's 5%, 15% or 30% —of lands worldwide would deliver the most benefits for biodiversity and carbon at the lowest cost when restored.

Researchers were further able to identify a global-level, multiple-benefits solution unconstrained by national boundaries that would deliver 91% of the potential benefit for biodiversity, 82% of the climate mitigation benefit, and reduce costs by 27% by focusing on areas with low implementation and opportunity costs.

When researchers looked at the benefits if the restoration were to take

place at the national level—which means that each country would restore 15% of its forests—they saw a reduction in biodiversity benefits by 28% and climate benefits by 29%, a rise in costs by 52%.

"These results highlight the critical importance of international cooperation in meeting these goals. Different countries have different, complementary roles to play in meeting overarching global targets on biodiversity and climate," Strassburg said.

Responding to fears that restoring ecosystems will encroach on the land needed for crop production, researchers calculated how many ecosystems could be revived without cutting into food supplies. They found that 55%, or 1,578 million hectares, of ecosystems that had been converted to farmlands, could be restored without disrupting food production. This could be achieved through the well-planned and sustainable intensification of food production, together with a reduction in food waste and a shift away from foods such as meat and cheese, which require large amounts of land and therefore produce disproportionate greenhouse gas emissions.

"As government officials gradually refocus on global climate and biodiversity goals, our study provides them with the precise geographic information they need to make informed choices about where to restore ecosystems," said Robin Chazdon, one of the report authors.

The approach is already supporting implementation at national and local scales. It's attracting the attention of policymakers, NGOs and the private sector due to the substantial cost-benefit increase of restoration efforts. "We intend to help restoration achieve massive scales by aligning socioecological and financial interests, simultaneously increasing impacts for nature and people while improving returns and reducing risks for investors," said Strassburg.

Overall, the study provides compelling evidence to policymakers seeking affordable, efficient ways to meet United Nations goals around biodiversity, climate and, additionally, desertification, that restoration, when well-coordinated and carried out in combination with the protection of intact ecosystems and the better use of agricultural lands, is an unmatched, though currently underused, solution.

"Our results provide very strong evidence of the benefits of pursuing joint planning and implementation of climate and biodiversity solutions, which is particularly timely given the landmark meetings planned for 2021 of the associated UN conventions on climate [biodiversity](#) and land degradation," Strassburg said.

"The study also demonstrates a crucial but hitherto unexplored application of the IUCN Red List of Threatened Species," noted Thomas Brooks, chief scientist at the International Union for Conservation of *Nature* and a co-author of the study. "It will inform discussion next year at IUCN World Conservation Congress and fifteenth CBD Conference of the Parties regarding implementation of policy commitments, including the Bonn Challenge, the UN Decade on Ecosystem Restoration and the Sustainable Development Goals."

"A new focus on prioritizing multiple outcomes of restoring ecosystems beyond forests, and beyond country level area-based targets, calls for intensifying international cooperation to realize globally important benefits of restoring the Earth's precious ecosystems. We need to stimulate action for the sake of a healthy planet," said Chazdon.

More information: Global priority areas for ecosystem restoration, *Nature* (2020). [DOI: 10.1038/s41586-020-2784-9](https://doi.org/10.1038/s41586-020-2784-9)

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