

Contact:

Jessica Brown, Media Relations Specialist

jbrown@conservation.org

734-748-7361

Study: Amazonian Forests, Wetlands Indispensable for Climate Stability

The tropical forestland contains Earth's rare "irrecoverable carbon" stores

Arlington, VA (November 18, 2021) – The mangroves, peatlands and forests of Amazonia are essential for global climate stability, according to [new research](#) out today from Conservation International that maps the places on Earth that humanity must protect to avoid a climate catastrophe. These ecosystems contain what researchers call “irrecoverable carbon,” dense stores of carbon that, if released due to human activity, could not be recovered in time for the world to prevent the most dangerous impacts of climate change.

The new worldwide map, published today in the journal *Nature Sustainability*, builds on a landmark [study that introduced the concept](#) of irrecoverable carbon. The research finds that half of Earth's irrecoverable carbon is highly concentrated on just 3.3% of land – primarily old-growth forests, peatlands and mangroves, all of which are found in the Amazon. Globally, these vast reserves of carbon are equivalent to 15 times the global fossil fuel emissions released last year.

According to the study, key ecosystems across the Amazon river basin collectively contain 31.5 gigatonnes (Gt) of irrecoverable carbon – equivalent to almost three and a half years' worth of global fossil fuel emissions and have some of the highest concentrations of irrecoverable carbon worldwide. Amazonia is home to 23% of all irrecoverable carbon on Earth, with Brazil (20.2 Gt), Peru (4.6), Colombia (4), Venezuela (2.7) and Bolivia (1.3) holding the most.

Researchers say that knowing which ecosystems contain the greatest irrecoverable carbon stores can help governments focus global efforts to protect 30% of land by 2030. Targeted conservation would yield big gains – protecting just 5.4% of lands high in irrecoverable carbon, in addition to the amount currently within protected areas, would keep 75% percent of Earth's irrecoverable carbon from being released into the atmosphere, researchers found.

“Knowing that irrecoverable carbon is concentrated in this region's tropical forests, mangroves and peatlands can help guide the protection of these ecosystems we now know are essential for Earth's climate” said Juan Carlos Ledezma, a Bolivia-based Conservation International scientist and study co-author. “We are at a pivotal moment for climate action – the science and the solutions are here, and we know that areas like the Igapó and aguajal forests are essential for global climate stability.”

While virtually all of the Amazon stores some level of irrecoverable carbon, there are several ecosystems where irrecoverable carbon is particularly concentrated. These include tropical forestlands like aguajal forests of northern Peru, peatlands like the seasonally flooded Igapó forest and the coastal wetlands – mangroves and swamp forests – stretching along the Atlantic coasts of Venezuela, Guyana, Suriname and French Guiana.

An [accompanying report](#), also released today, reveals that many of these irrecoverable carbon areas overlap with places containing high concentrations of biodiversity – meaning that protecting lands essential for climate stability would also conserve habitats for thousands of mammal, bird, amphibian and reptile species. The Amazon, for example, contains 10 percent of all known species living alongside the region’s 31.5 billion metric tons of irrecoverable carbon. The paper calls for the creation of “irrecoverable carbon reserves,” new, area-based conservation measures designed to ensure irrecoverable carbon remains in these critical ecosystems.

According to the *Nature Sustainability* study, the largest and highest-density irrecoverable carbon ecosystems, in addition to Amazonia, include

- The Congo Basin (8.2 Gigatonnes);
- Islands of Southeast Asia (13.1 Gigatonnes);
- The temperate forests of northwestern North America (5.0 Gigatonnes);
- Mangroves, seagrasses and tidal wetlands globally (4.8 Gigatonnes).

The study also details how vulnerable irrecoverable carbon areas are to human activity and climate change – and how much irrecoverable carbon is stored within Indigenous and protected lands. These key findings include

- Tropical ecosystems like the Amazon rainforest comprise most of the “doubly irreplaceable” land on Earth, making them high priority settings for both biodiversity conservation and climate change mitigation
- More than a third of irrecoverable carbon (46.7 billion Gigatonnes) is stored within the government-recognized lands of Indigenous peoples and local communities;
- Across ecosystems, the highest concentrations of irrecoverable carbon are found in mangroves (218 tonnes per hectare, on average), tropical peatlands (193 t/ha) and boreal wetlands (173 t/ha).

“The consequences of releasing this stored carbon would stretch on for generations, undermining our last chance to stabilize Earth’s climate at tolerable levels for nature and humanity,” said Johan Rockström, Conservation International chief scientist and co-director of the Potsdam Institute for Climate Impact Research, a leader in climate and sustainability research. “We must act now to safeguard the planet’s ability to serve as a carbon sink, which includes prioritizing these unique ecosystems.”

In the last decade alone, agriculture, logging and wildfires have released at least 4 gigatonnes of irrecoverable carbon, equal to 5% of human-caused fossil fuel emissions over that time, the study reveals. Threats to irrecoverable carbon vary by ecosystem and location, researchers noted, but the most imminent and widespread risks come from legal rollbacks to protected areas that shrink or eliminate existing protections, land use changes for agriculture or development or climate-change-driven events such as forest fires or extreme weather. Due in part to its size and geography across nine countries, Amazonia is at risk of all these threats.

“We have less than 10 years to cut emissions in half and prevent our climate and biodiversity from reaching an irreversible tipping point,” said Allie Goldstein, a co-author on the study and Conservation International’s director of climate protection. “The good news is that we haven’t yet reached that

threshold. This is a rare scenario in which we have the time and information needed to prevent environmental disaster before it happens. Our research shows that investing in irrecoverable carbon reserves is a win-win-win approach that can improve the health of our climate, the health of Earth's species and, ultimately, the health of humanity."

Susan Cook-Patton, a coauthor of the paper and senior forest restoration scientist with The Nature Conservancy said that, "given the strengthened commitments that need to come out of the Glasgow UNFCCC COP this year, this global map represents a valuable addition to the science toolkit for climate policymakers. It is especially critical that governments fast-track protection of irrecoverable carbon stores that are at imminent threat of irreparable damage. This map can help find those locations before it's too late."

To secure the benefits of irrecoverable carbon, the study's authors recommend

- Supporting Indigenous peoples and communities, who manage more than a third of Earth's irrecoverable carbon but face increasing threats to their lands;
- Immediately reversing policies and practices that threaten Earth's last remaining irrecoverable carbon reserves;
- Expanding the area of irrecoverable-carbon lands under conservation, through protected areas as well as Indigenous and community-led conservation measures;
- Prioritizing areas with high concentrations of irrecoverable carbon in strategies from national governments and multilateral funders such as the Global Environmental Facility, Green Climate Fund and World Bank;
- Designing comprehensive and collaborative land use planning practices that promote sustainable development and climate change resilience, such as fire and pest management and protecting coastal and freshwater wetlands to reduce flooding and storm surges.

To read the entire study authored by scientists from Conservation International, The Nature Conservancy, Wildlife Conservation Society, Potsdam Institute for Climate Impact Research and the University of Wisconsin-Madison, [click here](#).

For additional information and to view some of the study's maps, visit the irrecoverable carbon [landing page here](#).

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About Conservation International

Conservation International works to protect the critical benefits that nature provides to people. Through science, partnerships and fieldwork, Conservation International is driving innovation and investments in nature-based solutions to the climate crisis, supporting protections for critical habitats, and fostering economic development that is grounded in the conservation of nature. Conservation International works in 30 countries around the world, empowering societies at all levels to create a cleaner, healthier and more sustainable planet. Follow Conservation International's work on [Conservation News](#), [Facebook](#), [Twitter](#), [Instagram](#) and [YouTube](#).