

# Scientists discover that the world contains dramatically more trees than previously thought

By [Chris Mooney](#)

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In a [blockbuster study](#) released Wednesday in *Nature*, a team of 38 scientists finds that the planet is home to 3.04 *trillion* trees, blowing away the previously estimate of 400 billion. That means, the researchers say, that there are 422 trees for every person on Earth.

However, in no way do the researchers consider this good news. The study also finds that there are 46 percent fewer trees on Earth than there were before humans started the lengthy, but recently accelerating, process of deforestation.

“We can now say that there’s less trees than at any point in human civilization,” says Thomas Crowther, a postdoctoral researcher at the Yale School of Forestry and Environmental Studies who is the lead author on the research. “Since the spread of human influence, we’ve reduced the number almost by half, which is an astronomical thing.”

In fact, the paper estimates that humans and other causes, such as wildfires and pest outbreaks, are responsible for the loss of 15.3 billion trees each year — although the authors said at a press conference that perhaps 5 billion of those may grow back each year, so the net loss is more like 10 billion annually.

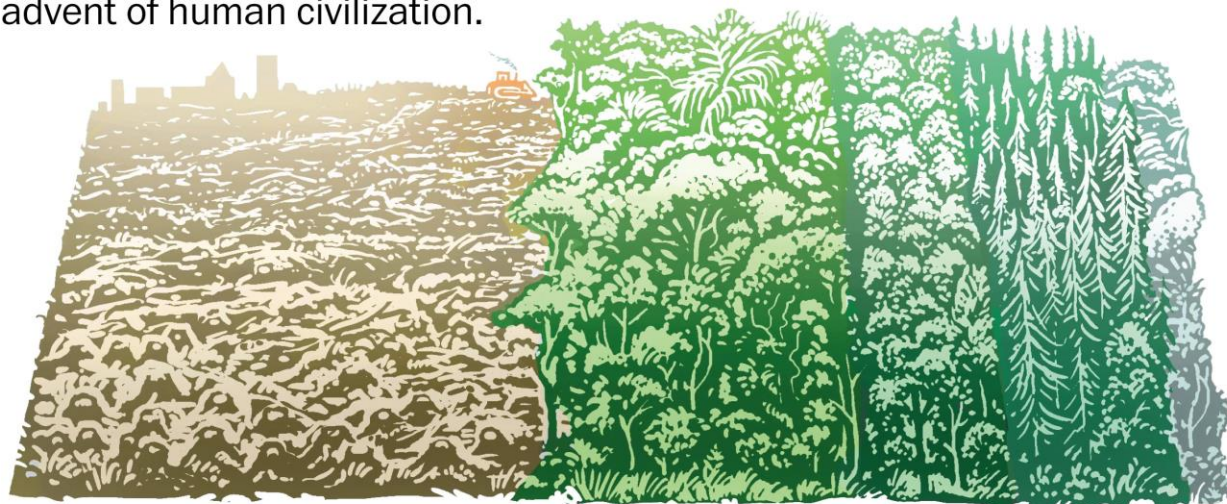
“The negative relationships between tree density and anthropogenic land use exemplify how humans contend directly with natural forest ecosystems for space,” the paper observes.

## The world's trees

15 billion trees are cut down yearly,  
a loss of more than two trees for every person.

The number of trees has fallen  
by **46 percent** since the  
advent of human civilization.

**3.04 trillion trees** remain.



SOURCE: Nature  
PATTERSON CLARK/  
THE WASHINGTON POST

<b>1.39T</b>	<b>0.61T</b>	<b>0.74T</b>
tropical and subtropical	temperate	boreal

The scientists were able to reach these estimates by merging together two separate mechanisms for sampling trees — satellite observations and ground-based ecological work. The former gives an overall view of where forests do and don't exist on the Earth's surface. But the latter goes underneath the canopy to determine how many trees exist in a given area in a given type of forest. Thus, the study amplified satellite views with no less than 429,775 separate measurements of the density of trees at different locations around the globe.

“This is a tremendous study that highlights the individual nature of trees as the dominant organisms that make up the forests and biomes that we know so well,” said Ted Schuur, a forest ecologist at Northern Arizona University who was not involved in the research, by email.

It's important to note that the study's estimates critically rely on the definition of “tree” — the study calls it a woody plant that, at breast height, has a stem that is at least 10 centimeters in diameter.

Even though the study has dramatically increased our estimate of how many trees there are on the planet, it does not in any way change our understanding of the

current rates of deforestation, observes Thomas Lovejoy, a conservation biologist at the United Nations Foundation who was not involved in the research.

“It does not say there’s more forest. It just says there’s more trees in the forest,” says Lovejoy.

Lovejoy added that it probably would not have been possible to conduct such sweeping research “five or ten years ago,” heralding the power of combining fieldwork with big data to create powerful analyses.

Crowther, the lead researcher, said his work was partly inspired by the [Billion Tree Campaign](#), which the United Nations Environment Programme created in 2006 and is now run by the Plant-for-the-Planet Foundation.

“They want to generate forests on a global scale,” says Crowther. “But they had absolutely no baseline information about how many trees they needed to plant to do that.”

The new research suggests that massively more trees need to be planted than previously thought — but Crowther said he thinks that will only inspire activists to redouble their efforts.

The study shows that trees are most prevalent in the tropics and subtropics — home to 1.39 trillion trees — but that boreal or northern forests contain another .74 trillion, and temperate forests contain .61 trillion. It also suggests, rather surprisingly, that boreal and tundra forests often have a greater tree density than tropical ones.

“To me, this really emphasizes the potential dynamism of trees in boreal and tundra ecosystems,” observed Michelle Mack, a forest researcher at Northern Arizona University, by email. “High tree density indicates potential for a rapid increase in forest cover in response to climate warming.” The regions will be less cold and forbidding, after all, and there will be more carbon dioxide in the air, which trees use in photosynthesis.

In a supplementary table accompanying the study, the authors provided a fascinating list of the countries of the world, their population sizes, and their numbers of trees. The results show sharply different tree-per-person ratios around the world.

The nation with the single largest number of trees was Russia, with 641 billion, and 4,461 trees per person based on 2014 population estimates — statistics underscoring the vastness of Siberia’s boreal forests.

The U.S. had 319 million people in 2014, but 228 billion trees. That’s 716 trees per person. Brazil had 301 billion trees (1,494 per person), Canada 318 billion (8,953 per person), and China 139 billion (102 trees per person). Among highly populous countries, India (population, 1.267 billion) had a tree population of only 35 billion, leading to just 28 trees per person.

The study emerges even as new research has highlighted alarming rates of global deforestation. Global Forest Watch Wednesday [released data](#) from the University of Maryland and Google finding that global forests lost 45 million acres last year, “an area twice the size of Portugal.”

Over half of the loss occurred in the tropics — and not just in traditional deforestation leaders like Brazil and Indonesia. Brazil has slowed its deforestation, but in other countries rates are increasing, including Cambodia, Sierra Leone, Madagascar, Paraguay, and Uruguay, the research found.

The new Nature study has myriad implications, but some of the largest are for the problem of global warming.

Trees pull carbon dioxide out of the atmosphere as they grow, and cutting or burning them down releases that carbon again. So that means that deforestation is making global warming worse — and it also means that if we were living on an Earth with close to 6 trillion trees, rather than 3 trillion, climate change would be less severe.

According to Crowther, the new baseline information on the total number of trees on the planet will be crucial in better understanding how forest restoration can help battle climate change.

“We can quantify the fossil fuel emissions,” he says. “Our ability to quantify the impacts of human land use change and deforestation are so minimal. We have to generate this baseline information about where the carbon is, where the trees are....before we can start generating these numbers.”