



## Global Warming May Increase the Capacity of Trees to Store Carbon

*ScienceDaily (May 31, 2011)* -- One helpful action anyone can take in response to global warming is to plant trees and preserve forests. Trees and plants capture carbon dioxide during photosynthesis, thereby removing the most abundant greenhouse gas from the atmosphere and storing some of it in their woody tissue.

Yet global warming may affect the capacity of trees to store carbon by altering forest nitrogen cycling, concludes a study led by Jerry Melillo of the Marine Biological Laboratory (MBL), published recently in *Proceedings of the National Academy of Sciences*.

The paper summarizes the results of a 7-year study at Harvard Forest in central Massachusetts, in which a section of the forest (about one-quarter of an acre) was artificially warmed about 9°F above ambient, to simulate the amount of climate warming that might be observed by the end of the century without aggressive actions to control greenhouse gas emissions from fossil-fuel burning and deforestation.

The study confirmed, as others have, that a warmer climate causes more rapid decomposition of the organic matter in soil, leading to an increase in carbon dioxide being released to the atmosphere.

But the study also showed, for the first time in a field experiment, that warmer temperatures stimulate the *gain* of carbon stored in trees as woody tissue, partially offsetting the soil carbon loss to the atmosphere. The carbon gains in trees, the scientists found, is due to more nitrogen being made available to the trees with warmer soil.

"Tree growth in many of the forests in the United States is limited by the lack of nitrogen," Melillo says. "We found that warming causes nitrogen compounds locked up in soil organic matter to be released as inorganic forms of nitrogen such as ammonium, a common form of nitrogen found in garden fertilizer. When trees take up this inorganic nitrogen, they grow faster and store more carbon."

Melillo says that the biological processes that link soil warming, increased soil organic matter decay, increased nitrogen availability to trees, and increased tree growth will likely operate together in many temperate and boreal forests -- forests found in North America, Europe, Eurasia and much of the developed world. Tree growth in tropical forests is often limited by factors other than nitrogen, so lessons from this new study are not widely relevant in the tropics.

While Melillo thinks that the carbon-nitrogen interactions he is studying at Harvard Forest will help us to make predictions of carbon storage in forest over the coming decades, he adds that "the carbon balance of forest ecosystems in a changing climate will also depend on other factors that will change over the century, such as water availability, the effects of increased temperature on both plant photosynthesis and aboveground plant respiration, and the atmospheric concentration of carbon dioxide."

From: <http://www.sciencedaily.com/releases/2011/05/110525120050.htm>



## PRESS RELEASE

### Global Warming May Affect the Capacity of Trees to Store Carbon, MBL Study Finds

WOODS HOLE, MA—One helpful action anyone can take in response to global warming is to plant trees and preserve forests. Trees and plants capture carbon dioxide during photosynthesis, thereby removing an important greenhouse gas from the atmosphere and storing some of it in their woody tissue.

Yet global warming may affect the capacity of trees to store carbon by altering forest nitrogen cycling, concludes a study led by Jerry Melillo of the Marine Biological Laboratory (MBL), published this week in *Proceedings of the National Academy of Sciences*.

The paper summarizes the results of a 7-year study at Harvard Forest in central Massachusetts, in which a section of the forest (about one-quarter of an acre) was artificially warmed about 9°F above ambient, to simulate the amount of climate warming that might be observed by the end of the century without aggressive actions to control greenhouse gas emissions from fossil-fuel burning and deforestation.

The study confirmed, as others have, that a warmer climate causes more rapid decomposition of the organic matter in soil, leading to an increase in carbon dioxide being released to the atmosphere.

But the study also showed, for the first time in a field experiment, that warmer temperatures stimulate the *gain* of carbon stored in trees as woody tissue, partially offsetting the soil carbon loss to the atmosphere. The carbon gains in trees, the scientists found, is due to more nitrogen being made available to the trees with warmer soil.

“Tree growth in many of the forests in the United States is limited by the lack of nitrogen,” Melillo says. “We found that warming causes nitrogen compounds locked up in soil organic matter to be released as inorganic forms of nitrogen such as ammonium, a common form of nitrogen found in garden fertilizer. When trees take up this inorganic nitrogen, they grow faster and store more carbon.”

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#### Citation:

Melillo, J., Butler, S., Johnson, J., Mohan, J., Steudler, P., Lux, H., Burrows, E., Bowles, F., Smith, R., Scott, L., Vario, C., Hill, T., Burton, A., Zhouj, Y, and Tang, J. (2011) Soil warming, carbon–nitrogen interactions, and forest carbon budgets. *PNAS: Early Edition* May 23, 2011, doi: 10.1073/pnas.1018189108

[PDF of paper](#)

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*The Marine Biological Laboratory (MBL) is dedicated to scientific discovery and improving the human condition through research and education in biology, biomedicine, and environmental science. Founded in 1888 in Woods Hole, Massachusetts, the MBL is an independent, nonprofit corporation.*

*This research was supported by the National Science Foundation and the Department of Energy.*

From: [http://mbl.edu/news/press\\_releases/2011\\_pr\\_05\\_24.html](http://mbl.edu/news/press_releases/2011_pr_05_24.html)

## Global warming may help trees store more carbon

Posted on May 31, 2011 - 06:12 by Kate Taylor

It's been known for a while that global warming speeds the decomposition of organic matter in soil, speeding up carbon dioxide release.



But new research shows that it can also have a beneficial effect, by allowing trees to store more carbon.

Jerry Melillo of the Marine Biological Laboratory (MBL) carried out a seven-year study at Harvard Forest in central Massachusetts. A quarter-acre section of the forest was artificially warmed by about nine degrees Fahrenheit, to simulate the amount of climate warming that might be observed by the end of the century.

The study confirmed that a warmer climate causes more rapid decomposition and increased the amount of carbon dioxide being released. However, it also showed, for the first time in a field experiment, that warmer temperatures stimulate trees to store more carbon as woody tissue, partially offsetting this loss.

The effect is caused by more nitrogen being made available to the trees with warmer soil.

"Tree growth in many of the forests in the United States is limited by the lack of nitrogen," says Melillo.

"We found that warming causes nitrogen compounds locked up in soil organic matter to be released as inorganic forms of nitrogen such as ammonium, a common form of nitrogen found in garden fertilizer. When trees take up this inorganic nitrogen, they grow faster and store more carbon."

We still can't rest easy, says Melillo. While the increased tree growth can be expected to show up in many temperate and boreal forests in North America, Europe and Eurasia, it may not occur in the tropics. There' he warns, tree growth is often limited by factors other than nitrogen.

"The carbon balance of forest ecosystems in a changing climate will also depend on other factors that will change over the century, such as water availability, the effects of increased temperature on both plant photosynthesis and aboveground plant respiration, and the atmospheric concentration of carbon dioxide," he warns.

From: <http://www.tgdaily.com/sustainability-features/56276-global-warming-may-help-trees-store-more-carbon>

## Trees May Store More Carbon in Warmer Climate

by Michael Graham Richard, Ottawa, Canada on 05.31.11



Photo: [Ella's Dad](#), Flickr, CC

### But...

A 7-year study in central Massachusetts shows that trees growing in warmer temperatures can absorb more carbon thanks to a change in the availability of nitrogen in the soil, but this isn't quite as good as it might first seem because this would only partially offset emissions from other sources, including releases from forest soil caused by the warmer climate.



Photo: [Aria Belli](#), Flickr, CC

A 7-year study at Harvard Forest in central Massachusetts looked at the impact of a 9-degree warmer climate on trees.

The study confirmed, as others have, that a warmer climate causes more rapid decomposition of the organic matter in soil, leading to an increase in carbon dioxide being released to the atmosphere.

**But the study also showed, for the first time in a field experiment, that warmer temperatures stimulate the gain of carbon stored in trees as woody tissue, partially offsetting the soil carbon loss to the atmosphere.**

The carbon gains in trees, the scientists found, is due to more nitrogen being made available to the trees with warmer soil.

This happens because tree growth is often limited by the availability of inorganic nitrogen.

This faster growth and carbon sequestration is only a partial offset of the CO<sub>2</sub> emitted by the soil, so we shouldn't get too excited about it. But if the effect is real, it should definitely be taken into account in climate models so we have a more accurate view of what might happen if we don't act to reduce the levels of atmospheric CO<sub>2</sub>.

Via [Science Daily](#)

From: <http://www.treehugger.com/files/2011/05/trees-may-store-more-carbon-in-warming-climate.php>

## NEWS ONE

Mobile News for iPhone, Android and Smartphones

### **Tree plantation may not fight global warming**

Posted on 26th May 2011

Washington, May 26 (IANS) One helpful action anyone can take to counter global warming is to plant trees and preserve forests. Trees and plants capture carbon dioxide during photosynthesis, thereby removing the most abundant greenhouse gas from the atmosphere and storing some of it in their woody tissue.

Yet global warming may affect the capacity of trees to store carbon by altering forest nitrogen cycling, concludes a study led by Jerry Melillo of the Marine Biological Lab (MBL), reports the journal Proceedings of the National Academy of Sciences.

The paper summarizes the results of a seven-year study at Harvard Forest in central Massachusetts, in which a fourth of an acre was artificially warmed about 9 degrees Fahrenheit above ambient, to simulate the amount of climate warming that might be observed by the end of the century without aggressive actions to control greenhouse gas emissions from fossil-fuel burning and deforestation, according to a Marine Lab statement.

The study confirmed, as others have, that a warmer climate causes more rapid decomposition of the organic matter in soil, leading to an increase in carbon dioxide being released to the atmosphere.

From: <http://www.inewsone.com/2011/05/26/tree-plantation-may-not-fight-global-warming/53108>



## Global Warming May Affect Carbon Storing Capacity of Trees

May 26, 2011



*Harvard Forest in Petersham, Massachusetts, a National Science Foundation Long-Term Ecological Research site.*

According to a new study, the increase in global temperatures may play a significant role in altering the capacity trees have to store carbon dioxide, by changing the forest nitrogen cycle.

The study, led by Jerry Melillo of the Marine Biological Laboratory (MBL), published this week in Proceedings of the National Academy of Sciences, summarises 7 years' worth of study at Harvard Forest in central Massachusetts, wherein a section of the forest was artificially warmed to 9 degrees Fahrenheit above ambient temperature in an attempt to mimic temperatures expected by the end of this century if no actions are taken to curb the emission of greenhouse gases.

The study confirmed what others have already shown, that a warmer climate will cause faster decomposition of organic matter in the forest soil, which in turn will lead to a faster release of carbon dioxide into the atmosphere.

However, for the first time in a field experiment, this study also showed that warmer temperatures also increase the gain of carbon dioxide in trees, which will partially offset the carbon lost to the atmosphere through decomposition.

The scientists found that the increase in carbon gain is a result of the fact more nitrogen is being made available thanks to the warmer soils.

“Tree growth in many of the forests in the United States is limited by the lack of nitrogen,” Melillo says. “We found that warming causes nitrogen compounds locked up in soil organic matter to be released as inorganic forms of nitrogen such as ammonium, a common form of nitrogen found in garden fertilizer. When trees take up this inorganic nitrogen, they grow faster and store more carbon.”

While Melillo thinks that the carbon-nitrogen interactions he is studying at Harvard Forest will help us to make predictions of carbon storage in forest over the coming decades, he adds that “the carbon balance of forest ecosystems in a changing climate will also depend on other factors that will change over the century, such as water availability, the effects of increased temperature on both plant photosynthesis and aboveground plant respiration, and the atmospheric concentration of carbon dioxide.”

From: <http://planetsave.com/2011/05/26/global-warming-may-affect-carbon-storing-capacity-of-trees/>