

## Science News

from research organizations

### Vegetation growth in Northern Hemisphere stunted by water constraints in warming climate

Shift may reduce plants' ability to absorb atmospheric CO<sub>2</sub>, increasing greenhouse gasses

**Date:** June 24, 2021

**Source:** Indiana University

**Summary:** A new study of vegetation growth in the Northern Hemisphere over the past 30 years has found that vegetation is becoming increasingly water-limited as global temperatures increase, which has the potential to reduce plants' ability to absorb atmospheric CO<sub>2</sub>, increasing greenhouse gasses.

**Share:** [!\[\]\(faf942dc3e59ce8eb64b4ac481eca7e0\_img.jpg\)](#) [!\[\]\(f6b0299e0b5e4340e509b71914970da0\_img.jpg\)](#) [!\[\]\(b5153706f6ea2fc2c42e8803b6804d18\_img.jpg\)](#) [!\[\]\(2b8adb27d8c9518333278b6317e2d8a2\_img.jpg\)](#) [!\[\]\(a190466037967efc7087885259e58e7a\_img.jpg\)](#)

#### FULL STORY

A first-of-its-kind large-scale study of vegetation growth in the Northern Hemisphere over the past 30 years has found that vegetation is becoming increasingly water-limited as global temperatures increase.

The results are significant since vegetation is one of the biggest factors when it comes to controlling water and carbon cycling across Earth, which influences global temperatures. The work by IUPUI and Indiana University Bloomington researchers Wenzhe Jiao, , Qing Chang and Honglang Wang was published in the journal *Nature Communications* on June 18.

"Without water, living things struggle to survive, including plants," said Lixin Wang, senior author of the study and an associate professor of earth sciences at the School of Science at IUPUI. His ecohydrology group led the study. "Changes in vegetation response to water availability can result in significant shifts of climate-carbon interaction."

Honglang Wang is an assistant professor of statistics at the School of Science at IUPUI. Wenzhe Jiao, the first author, and Qing Chang are Ph.D. students at IUPUI and IU Bloomington, respectively.

This multidisciplinary research between the School of Science at IUPUI, the O'Neill School of Public and Environmental Affairs at IU Bloomington and two other universities began three years ago to determine vegetation constraints on a global scale. Until now, it was largely unknown, despite the growing interest in predicting global and regional trends in vegetation growth in response to climate change.

"Global temperature and the concentration of atmospheric CO<sub>2</sub>, or carbon dioxide, have been increasing," Lixin Wang said. These changes are expected to cause increased atmospheric water demand, more frequent extreme hot days, and drought events. All these factors indicate that vegetation growth may have suffered more and more water stress under a warming climate.

"However, quantifying the changes in vegetation constraints at large spatial and temporal scales is challenging," he said.

To overcome this obstacle, the researchers used satellite remote sensing data and meteorology data covering large spatial scales from 1982 to 2015.

"We developed our own metrics to indicate water constraints and then examined the changes in the metrics," Jiao said. "The study is quite computationally extensive since we examined the relationship between vegetation growth and water deficit at each grid cell over the whole extratropical Northern Hemisphere -- 604,800 data points each year -- over more than 30 years."

The data analysis provided strong evidence of a widespread, significant increase in water vegetation constraint in the Northern Hemisphere over the studied period. Some regions, like the Great Plains in the United States, were comparatively worse than others.

Until recently, elevated carbon in the atmosphere increased plant growth, which has the benefit of removing more carbon from the atmosphere. However, this study reveals a cause for concern.

"Increasing water constraints on vegetation productivity may drive a shift from a period of increasing land carbon sink strength to a period in which climate change is reducing land carbon sink strength," Lixin Wang said.

In other words, the warming climate is increasing water constraints, reversing the earlier trend of stronger vegetation carbon uptake.

"Our research shows that increasing water constraints will likely limit continuous vegetation growth, thus slowing down the removal of CO<sub>2</sub> from the atmosphere by plants," Jiao said.

"The results emphasize the need for actions that could slow down CO<sub>2</sub> emissions," Lixin Wang said. "Without that, water constraints impacting plant growth -- and the weakening of vegetation's ability to removal of CO<sub>2</sub> from the atmosphere -- are unlikely to slow."

---

### Story Source:

Materials provided by **Indiana University**. *Note: Content may be edited for style and length.*

---

### Journal Reference:

1. Wenzhe Jiao, Lixin Wang, William K. Smith, Qing Chang, Honglang Wang, Paolo D'Odorico. **Observed increasing water constraint on vegetation growth over the last three decades**. *Nature Communications*, 2021; 12 (1) DOI: 10.1038/s41467-021-24016-9
- 

### Cite This Page:

MLA	APA	Chicago
-----	-----	---------

---

Indiana University. "Vegetation growth in Northern Hemisphere stunted by water constraints in warming climate: Shift may reduce plants' ability to absorb atmospheric CO<sub>2</sub>, increasing greenhouse gasses." ScienceDaily. ScienceDaily, 24 June 2021. <[www.sciencedaily.com/releases/2021/06/210624152641.htm](http://www.sciencedaily.com/releases/2021/06/210624152641.htm)>.

## RELATED STORIES

---

### Towards a New Generation of Vegetation Models

May 11, 2020 — Plants and vegetation play a critical role in supporting life on Earth, but there is still a lot of uncertainty in our understanding of how exactly they affect the global carbon cycle and ecosystem ...

### Rising CO2 Levels Could Boost Wheat Yield but Slightly Reduce Nutritional Quality

July 24, 2019 — Levels of atmospheric carbon dioxide (CO<sub>2</sub>) are rising, which experts predict could produce more droughts and hotter temperatures. Although these weather changes would negatively impact many plants' ...

### Commercial Airliners Reveal Three-Dimensional Distribution of Atmospheric CO<sub>2</sub> Over Asia Pacific

Nov. 6, 2018 — Ten years of commercial airliner-based measurements uniquely revealed three-dimensional distribution of atmospheric CO<sub>2</sub> and its seasonality over Asia Pacific. Asia has been only sparsely monitored ...

### Nearly Half of California's Vegetation at Risk from Climate Stress

Jan. 25, 2018 — Current levels of greenhouse gas emissions are putting nearly half of California's natural vegetation at risk from climate stress. However, cutting emissions so that global temperatures increase ...

## FROM AROUND THE WEB

---

*ScienceDaily shares links with sites in the TrendMD network and earns revenue from third-party advertisers, where indicated.*

### **Why are East Asian ecosystems important for carbon cycle research?**

JingYun FANG et al., SCIENCE CHINA Life Sciences, 2010

### **Global warming, human-induced carbon emissions, and their uncertainties**

JingYun FANG et al., SCIENCE CHINA Earth Sciences, 2011

### **Simulating the response of the Quercus mongolica forest ecosystem carbon budget to asymmetric warming**

HongXin SU et al., Chinese Science Bulletin, 2012

### **Temperature variations over the past 600 years documented by a $\delta^{13}\text{C}$ record from terrestrial plant remains from Kanas Lake, Altai Mountains, Northwestern China**

YuHui WANG et al., Chinese Science Bulletin, 2017

### **Enhancing phytolith carbon sequestration in rice ecosystems through basalt powder amendment**

Fengshan Guo et al., Science Bulletin, 2015

### **Thermo Fisher Scientific Gets FDA Clearance for Red Meat Allergy Test**

staff reporter, 360Dx, 2020

### **Response of grain crop yields to climate warming**

Yao HUANG, Chinese Science Bulletin, 2017

### **KBMO Dx Receives FDA Warning About Unauthorized At-Home Collection for Coronavirus Testing**

staff reporter, 360Dx, 2020


---

## Free Subscriptions

---

Get the latest science news with ScienceDaily's free email newsletters, updated daily and weekly. Or view hourly updated newsfeeds in your RSS reader:

 [Email Newsletters](#)

 [RSS Feeds](#)

## Follow Us

---

Keep up to date with the latest news from ScienceDaily via social networks:

 [Facebook](#)

 [Twitter](#)

 [LinkedIn](#)

## Have Feedback?

---

Tell us what you think of ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

 [Leave Feedback](#)

 [Contact Us](#)

[About This Site](#) | [Staff](#) | [Reviews](#) | [Contribute](#) | [Advertise](#) | [Privacy Policy](#) | [Editorial Policy](#) | [Terms of Use](#)

Copyright 2021 ScienceDaily or by other parties, where indicated. All rights controlled by their respective owners. Content on this website is for information only. It is not intended to provide medical or other professional advice. Views expressed here do not necessarily reflect those of ScienceDaily, its staff, its contributors, or its partners.

Financial support for ScienceDaily comes from advertisements and referral programs, where indicated.

— [CCPA: Do Not Sell My Information](#) — — [GDPR: Privacy Settings](#) —