

# Kudzu can release soil carbon, accelerate global warming

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Clemson research shows that invasive plants, such as Japanese knotweed, can accelerate the greenhouse effect by releasing carbon stored in soil into the atmosphere.

Clemson University scientists are shedding new light on how invasion by exotic plant species affects the ability of soil to store greenhouse gases. The research could have far-reaching implications for how we manage agricultural land and native ecosystems.

In a paper published in the scientific journal *New Phytologist*, plant ecologist Nishanth Tharayil and graduate student Mioko Tamura show

that invasive plants can accelerate the greenhouse effect by releasing [carbon](#) stored in soil into the atmosphere.

Since soil stores more carbon than both the atmosphere and terrestrial vegetation combined, the repercussions for how we manage agricultural land and ecosystems to facilitate the storage of carbon could be dramatic.

In their study, Tamura and Tharayil examined the impact of encroachment of Japanese knotweed and kudzu, two of North America's most widespread invasive plants, on the soil carbon storage in native ecosystems.

They found that kudzu invasion released carbon that was stored in native soils, while the carbon amassed in soils invaded by knotweed is more prone to oxidation and is subsequently lost to the atmosphere.

The key seems to be how plant litter chemistry regulates the soil biological activity that facilitates the buildup, composition and stability of carbon-trapping organic matter in soil.



This layer of decomposing knotweed will eventually form soil organic matter in invaded ecosystems.

"Our findings highlight the capacity of invasive plants to effect [climate change](#) by destabilizing the carbon pool in soil and shows that [invasive plants](#) can have profound influence on our understanding to manage land in a way that mitigates [carbon emissions](#)," Tharayil said.

Tharayil estimates that kudzu invasion results in the release of 4.8 metric tons of carbon annually, equal to the amount of carbon stored in 11.8 million acres of U.S. forest.

This is the same amount of carbon emitted annually by consuming 540 million gallons of gasoline or burning 5.1 billion pounds of coal.

"Climate change is causing massive range expansion of many exotic and [invasive plant species](#). As the climate warms, kudzu will continue to invade northern ecosystems, and its impact on carbon emissions will grow," Tharayil said.

The findings provide particular insight into [agricultural land](#)-management strategies and suggest that it is the chemistry of plant biomass added to soil rather than the total amount of biomass that has the greatest influence on the ability of soil to harbor stable carbon.

"Our study indicates that incorporating legumes such as beans, peas, soybeans, peanuts and lentils that have a higher proportion of nitrogen in its biomass can accelerate the storage of carbon in soils," Tharayil said.

Tharayil's lab is following up this research to gain a deeper understanding of soil carbon storage and invasion.

Tharayil leads a laboratory and research team at Clemson that studies how the chemical and biological interactions that take place in the plant-[soil](#) interface shape plant communities. He is also the director of Clemson's Multi-User Analytical Laboratory, which provides researchers with access to highly specialized laboratory instruments.

Provided by Clemson University

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